ELECTRICAL CONSTRUCTION AND MAINTENANCE

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DECEMBER · 1949

NECA CONVENTION REPORT

Roundup of people, programs, and projects from the Houston convention of the National Electrical Contractors Association.

Also

a new approach to overhead appraisal, cost saving methods in electrical maintenance, and how to install signal systems in wet locations.

A McGRAW-HILL PUBLICATION

1st STEP to lower power costs!

CHECK POWER FACTOR WITHOUT INTERRUPTING SERVICE WITH NEW AF-2 LOAD VISUALIZER

Does your power contract allow for reduced charges for high power factor? If so, improving power factor is a way to cut costs that's too good to miss. Also, improving the power factor gives relief to overloaded feeder circuits and transformers, results in better voltage regulation.

Now you can make the first step in improvement—checking present power factor—without cutting conductors or interrupting service. The whole job is done with the new AF-2 load visualizer and split-core transformer. It measures volts, line amperes, component amperes directly. Then power factor, watts, vars are read on a handy calculator.

For the full story, check your nearest G-E Representative—today. Or write for bulletin GEC-372. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

many applications

Testing Motors
Checking power and lighting circuits
Checking transformers
Or analyzing *any* a-c load

measures

Voltage **Current**
Power Factor
Watts **Vars**

GENERAL ELECTRIC

602-163

RENCH IT!

terlocked—seam hubs won't ve, turn or break off!

NOW!

NEW STRENGTH!
NEW STAMINA!
NEW ENDURANCE!
in the IMPROVED
Murray
Steel METER SOCKET

SOCK IT!

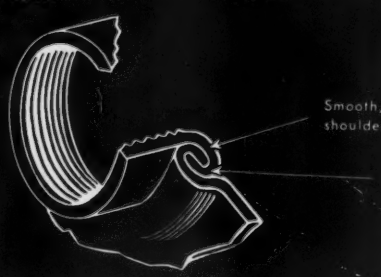
If abnormal abuse should deform the steel, just bend it back again — the interlocked-seam hubs will stay watertight!

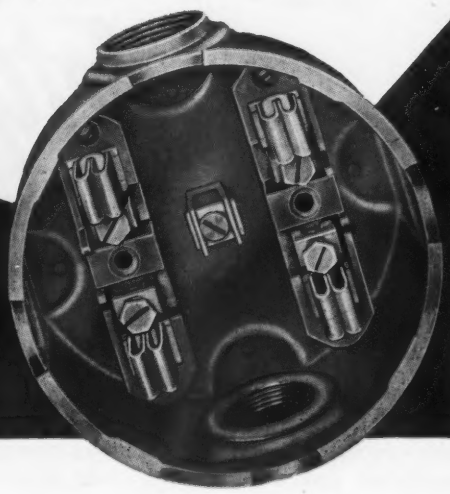
DROP IT!

Even screwed onto a twelve-foot length of conduit, this socket takes terrific punishment!

How do we do it?

Take a look at this precision interlocked seam that anchors hubs to shell in the improved Murray meter socket. Engineers said it couldn't be done — yet here it is. Rigid . . . rugged . . . waterproof — these hubs *can't* loosen up, *can't* fall out, *can't* break off. No welds, no die castings, no flimsy alloys — just tough, sturdy, dependable steel.





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MANUFACTURING CORPORATION

50 Years of Service to the Electrical Industry

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The *Improved* Murray steel meter socket is weatherproofed by zinc coating and baked-on melamine finish. Two or three hubs, size 1" or 1¼"; four, five or six jaws. Reversible jaws for horizontal or vertical mounting. Solderless connectors can be swung into the gutter for bussing. Connectors take No. 1 wire.

The *Improved* Murray meter socket is available either separately or in this preassembled yard-pole combination with Murray fully magnetic circuit breaker protection, approved by R.E.A. Write for complete specifications.

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New Federal Noark Protectit is today's outstanding fractional horsepower manual motor starter

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ELECTRICAL CONSTRUCTION AND MAINTENANCE

With which is consolidated Electrical Contracting The Electragist and Electrical Record . . . Established 1901

A practical technical and management journal for electrical contractors, industrial electricians, inspectors, engineers and motor shops, covering engineering installations, repairing, maintenance and management, in the field of electrical construction and maintenance.

December • 1949

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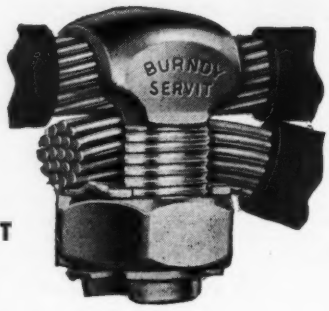

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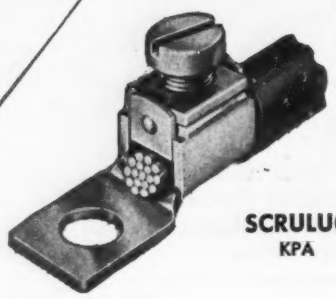

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They're designed with *you* in mind. Each connector, whether it be a tap, terminal or splice, is especially engineered for its specific job. Without fuss or fumble, each Burndy connector is installed quickly and simply. With a few sizes and types you can do almost any connecting job.

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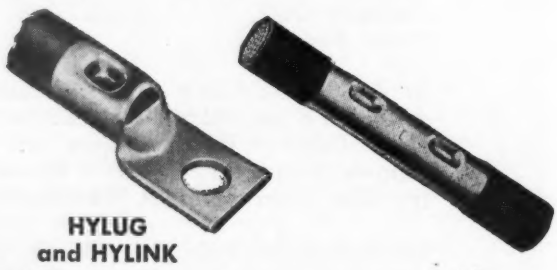

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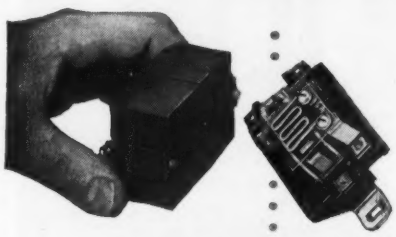
INCREASED VALUE

no increase in price

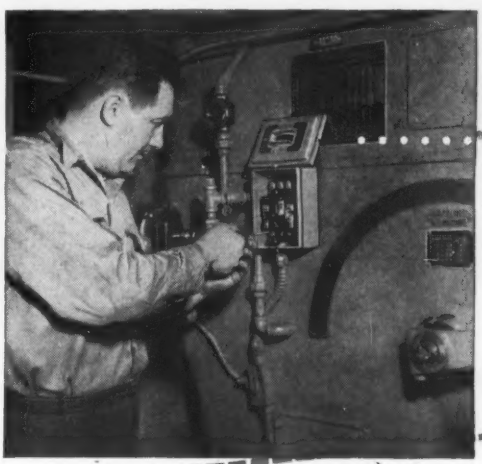
GE manual motor starters...



.... feature quick, easy installation; positive overload protection with long-life bi-metallic relays; easy wiring and servicing because terminals are wired from the front. Application—fractional and integral motors up to 7½ horsepower.

The CR1061 controls a handkerchief ironer in a modern laundry.

The CR1062 is easy to mount and wire. Used here on a coolant pump.



Roomy, attractive case can be mounted on or beside the machine. Sturdy switch mechanism resists vibration. New push-button as well as toggle-type forms now available for integral motor starting. All forms—watertight, dust-tight, and explosion-proof—available in both lines. Write now for more information. *Remember, these new starters have all the features you've been wanting at no increase in price.*

General Electric Company
Apparatus Dept., Sec. E730-9
Schenectady 5, N. Y.

Please send me—
Bulletin GEA-2234E on CR1061 Fractional-hp Motor Starters
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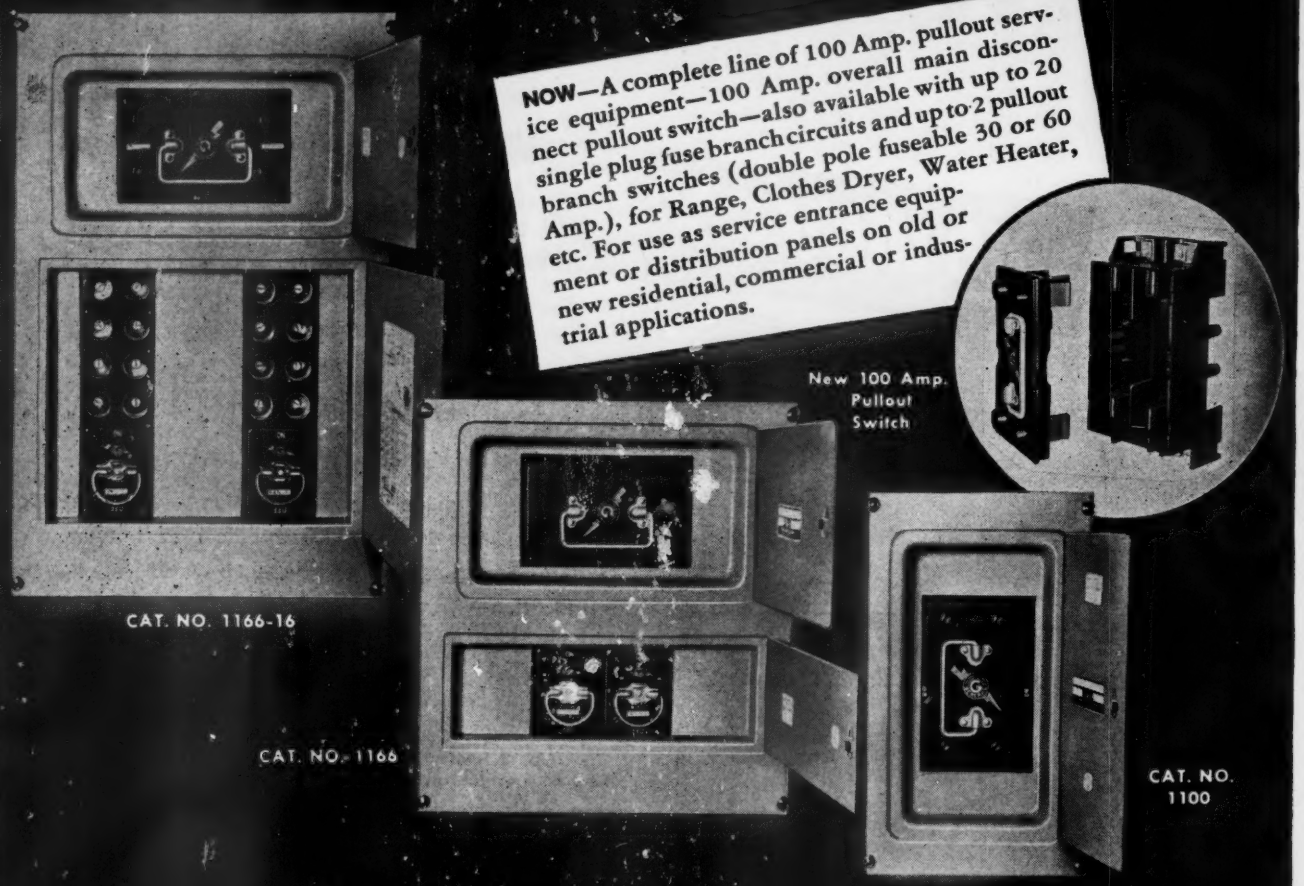
GENERAL ELECTRIC

The latest reason why the Switch is to General

NOW—A complete line of 100 Amp. pullout service equipment—100 Amp. overall main disconnect pullout switch—also available with up to 20 single plug fuse branch circuits and up to 2 pullout branch switches (double pole fuseable 30 or 60 Amp.), for Range, Clothes Dryer, Water Heater, etc. For use as service entrance equipment or distribution panels on old or new residential, commercial or industrial applications.



Service Equipment with 100 Amp. Main Disconnect

GENERAL'S new 100 Amp. pullout service equipment is modern in design, appearance and performance and the latest result of General's long range product development program. Examine the construction features of this new equipment at your earliest opportunity. Available everywhere exclusively through wholesalers.

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. . . the new designs with more knockouts and knuckle room?

The New catalog supplement 4911 completely describing the 100 and 200 Amp. lines?

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Type NMO MULTI-BREAKER "Plug-in"

BREAKERPANELS

TRADE MARK

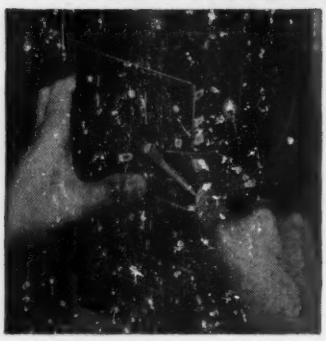
Tailor-made for the job-on the job

Cutler-Hammer Type NMO Breakerpanels make it easy to "tailor" the circuit requirements of each job . . . either when the panel is first installed . . . or at any time later when the requirements of one or more of the circuits has changed. How is this done? It is very simple!! The Multi-Breaker unit serving each circuit just plugs into place. Where you want a 15 ampere breaker, you plug in a unit containing the exact number of 15 ampere single pole breakers required up to four. These four pole units are available in *17* different circuit combinations making it possible to obtain the exact quantity and rating of branch circuits with a minimum of effort.

Wiring these Type NMO Multi-Breaker units is also a cinch. You can wire them right in your hands before you plug them in . . . or you can simply swing them out for wiring as shown, using one of the positive-pressure contact jaws turning on the silvered bus bar as a hinge. And despite the small size of these Breakerpanels that better utilize wall and column space, you get much more gutter space (5½" in the 15" box) *with* more circuits. The narrow column type actually has *double* the number of circuits previously available in cabinets of similar height.

Cutler-Hammer Type NMO "Plug-In" Breakerpanels are now offered in sizes with from 8 to 42 single pole branch circuits in increments of 2. They are available in 120/240 Volts a.c., with 50, 100 and 200 ampere mains (lugs or circuit breaker) with 15, 20 and 30 ampere single and double-pole branch circuits; also, 40 and 50 ampere double-pole branch circuits each of which however, occupies the same space as four single pole 15 ampere breakers. Multi-Breaker units are of the thermal-magnetic type that provide a lag on harmless overloads but instant trip on shorts.

Beyond any doubt, this is the finest protection, the easiest to install, the most flexible, the most compact, and the most modern it is possible to obtain where a large number of branch circuits must be served, as in commercial and industrial buildings, hotels, schools, hospitals, large homes, etc. CUTLER-HAMMER, Inc., 1306 St. Paul Avenue, Milwaukee 1, Wis.



1. Select Multi-Breaker units required by job.

2. Assemble units to panel by "plugging in".

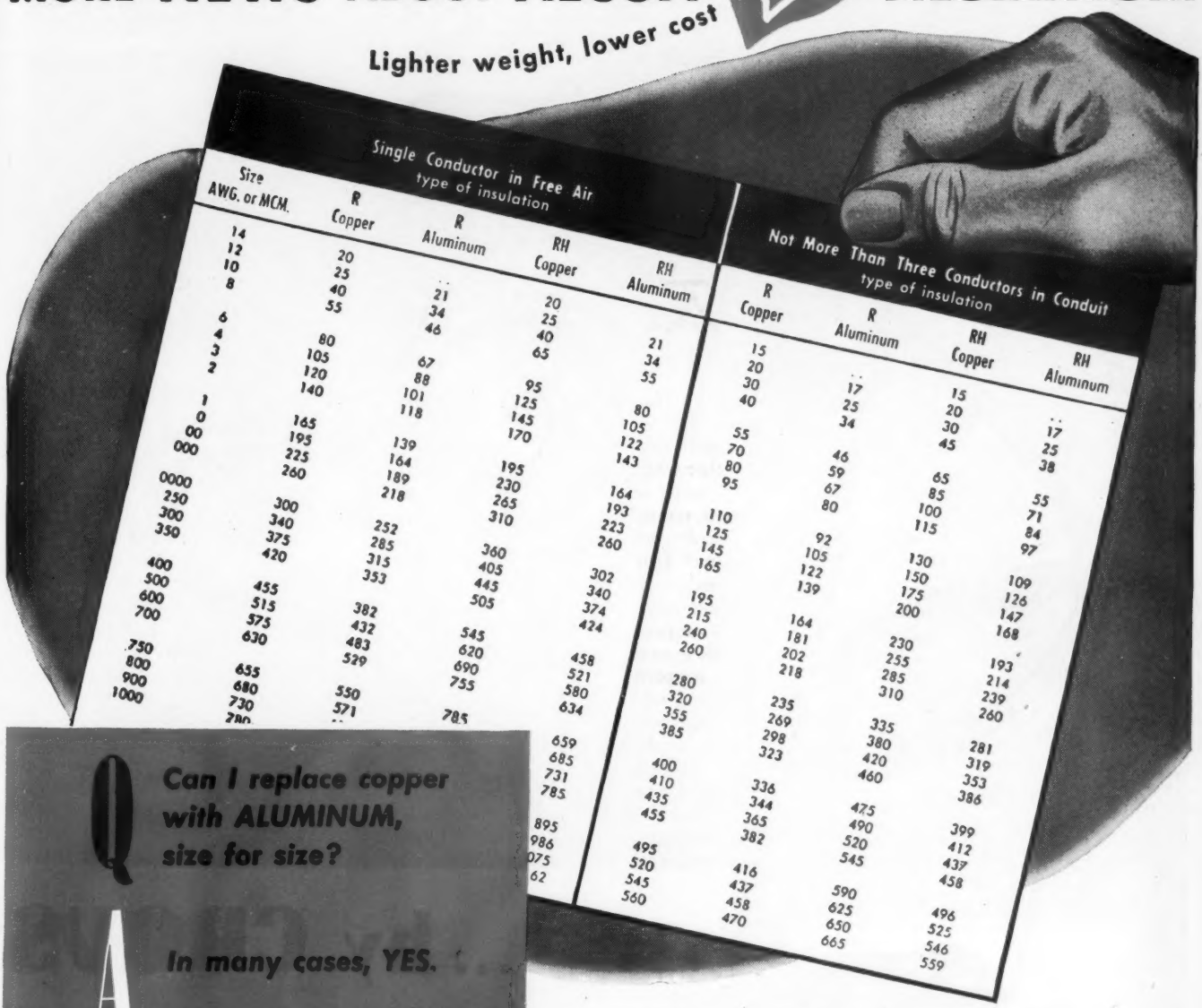
3. Wire them.

4. Plug them in place again.

CUTLER-HAMMER
BREAKERPANELS
C-H

MORE NEWS ABOUT ALCOA EC ALUMINUM on the job Today

Lighter weight, lower cost



Size AWG. or MCM.	Single Conductor in Free Air, type of insulation: R Copper	R Aluminum	RH Copper	RH Aluminum	Not More Than Three Conductors in Conduit, type of insulation: R Copper	R Aluminum	RH Copper	RH Aluminum
14	20	..	20	..	15	..	15	..
12	25	21	25	21	20	17	20	17
10	40	34	40	34	30	25	30	25
8	55	46	65	55	40	34	45	38
6	80	67	95	80	55	46	65	55
4	105	88	125	105	70	59	85	71
3	120	101	145	122	80	67	100	84
2	140	118	170	143	95	80	115	97
1	165	139	195	164	110	92	130	109
0	195	164	230	193	125	105	150	126
00	225	189	265	223	145	122	175	147
000	260	218	310	260	165	139	200	168
0000	300	252	360	302	195	164	230	193
250	340	285	405	340	215	181	255	214
300	375	315	445	374	240	202	285	239
350	420	353	505	424	260	218	310	260
400	455	382	545	458	280	235	335	281
500	515	432	620	521	320	269	380	319
600	575	483	690	580	355	298	420	353
700	630	529	755	634	385	323	460	386
750	655	550	785	659	400	336	475	399
800	680	571	..	685	410	344	490	412
900	730	..	..	731	435	365	520	437
1000	780	..	..	785	455	382	545	458
..	..	..	..	895	495	416	590	496
..	..	..	..	986	520	437	625	525
..	..	..	..	075	545	458	650	546
..	..	..	..	62	560	470	665	559

Q Can I replace copper with ALUMINUM, size for size?

A In many cases, YES.

Tables courtesy *Factory Management and Maintenance*, based on tables 1 and 2, National Electrical Code.

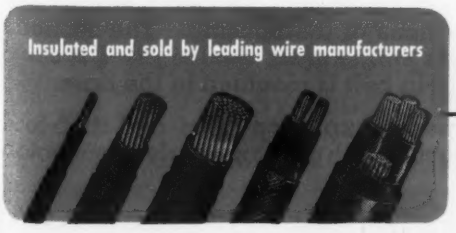
Check the current ratings! You'll see that wire and cable with Alcoa E.C.* Aluminum conductor with type RH Insulation can replace copper with type R Insulation. This gives you superior insulation plus aluminum's lighter weight and low cost.

Mechanical, soldered or welded joints are used. Fittings are supplied by reliable manufacturers.

Alcoa makes light, strong, conductive E.C. Aluminum; leading wire manufacturers draw, strand and insulate it, and sell it under their own trademarks. Investigate the savings it can yield on a single job!

Ask your wire supplier, or write ALUMINUM COMPANY OF AMERICA, 2197M Gulf Building, Pittsburgh 19, Penna.

*E.C.: *Electrical Conductor* Aluminum



ALCOA EC ALUMINUM

FOR ELECTRIC WIRE AND CABLE

NOW A compact desk ty

For Wall or Panel Mounting

A Nationwide Distribution Through Electrical Wholesalers

... by CROUSE H

Locations in which the surrounding atmospheres contain sufficient quantities of flammable vapors, gases, or highly combustible dusts to create explosive mixtures are designated as hazardous by the National Electrical Code. Crouse-Hinds Explosion-Proof and Dust-Tight ET Series Telephones were especially designed for service in such hazardous locations.

These explosion-proof telephones are made in four types:
- Type ETDA desk telephone, automatic.
- Type ETDM desk telephone, manual.
- Type ETWA for wall or panel mounting, automatic.
- Type ETWM for wall or panel mounting, manual.

All types are built to the high standard of Crouse-Hinds quality; carefully manufactured from the finest materials by highly skilled craftsmen. The cast aluminum housing is engineered to combine maximum strength with light weight, small size, and attractive stream-lining. There is a flame-tight joint between the two sections of the housing. The sections are held together by extra strong heat treated steel socket-head cap screws. A built-in bell is mounted in the base.

The handset on all types is explosion-proof and its 5-foot cord is attached to the housing with a factory-sealed connector.

CONDULETS · TRAFFIC SIGNALS

k-type *Explosion-Proof* telephone

E-HINDS

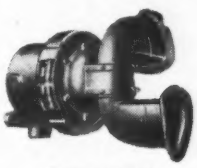
The desk telephone has rubber feet to protect the surface on which it rests.

The wall telephone is designed for mounting with the dial up and is equipped with a steel mounting plate. The base is reversible so the conduit hub can be at the top or at the bottom. The base also has a hub on the back for use if the conduit enters from the rear.

Both the desk and wall telephones should be connected to the Type ETS Line Switch, which can be mounted at any convenient location near the telephone.

In noisy locations where the built-in bell would be inadequate, separate loud ringing bells or horn signals can be installed.

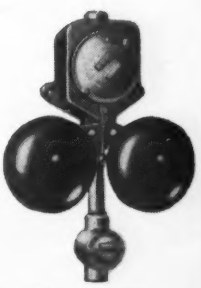
Complete listings of explosion-proof telephones and accessories are in Crouse-Hinds Condulet Catalog.



Type ETH
High Power
Horn Signal
Double Projector

Type ETS
Line Switch

Type ETF
Extension Telephone
with Line Switch



Type ETR
Loud Ringing
Bell Signal

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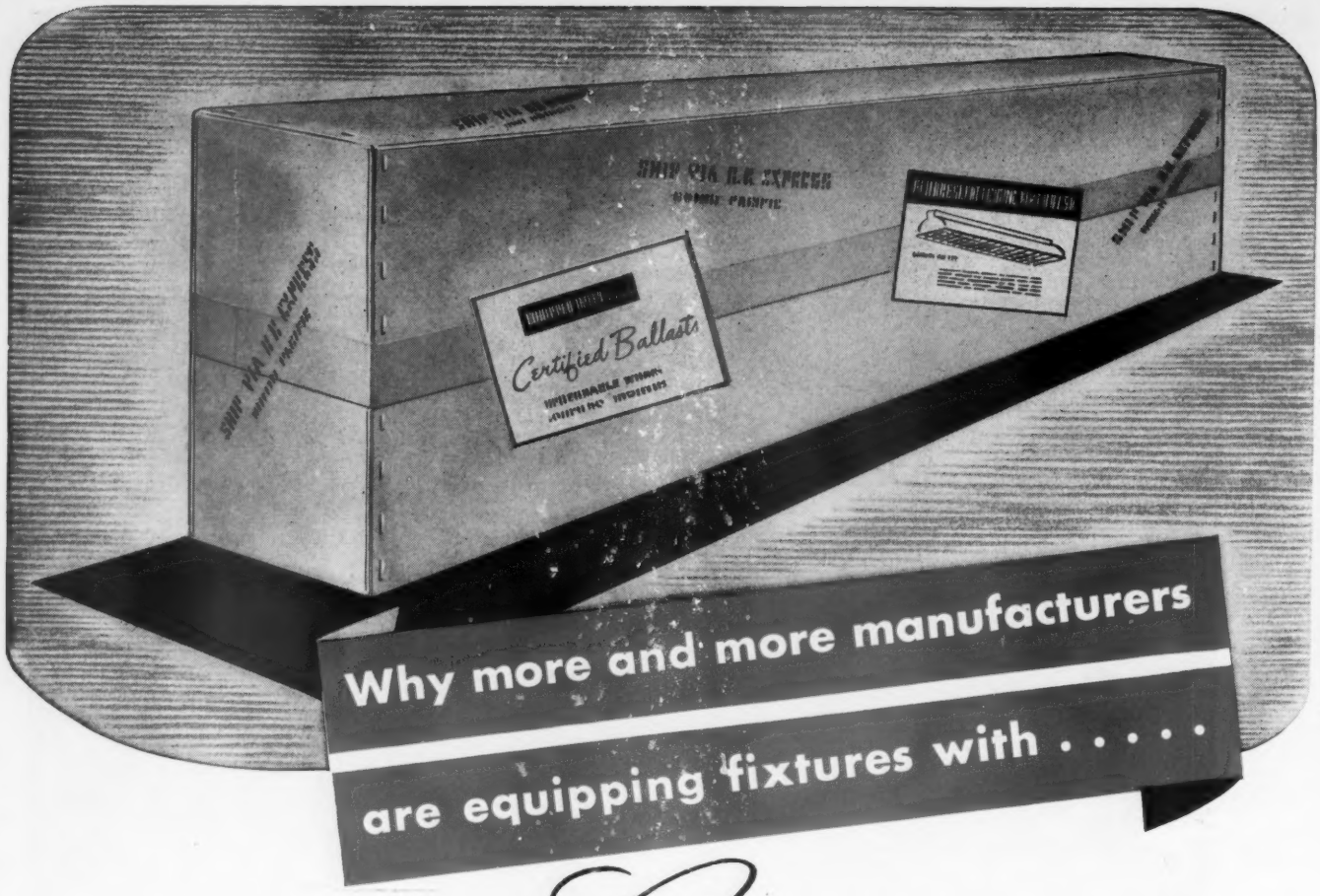

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● Do customers complain that fluorescent tubes in your fixtures seem to burn out too soon? Perhaps the trouble lies in the ballast that operates them.

One of the advantages of CERTIFIED BALLASTS is that they assure *Full Lamp Life.* Leading fluorescent tube manufacturers recognize that CERTIFIED BALLASTS in a fixture are evidence that full rated tube life should result.

Other worthwhile advantages of CERTIFIED BALLASTS include: *Rated Light Output* and *Long Dependable Performance.*

CERTIFIED BALLASTS are made to exacting specifications, then tested and certified by Electrical Testing Laboratories, Inc., an impartial authority, to assure best operation of tubes and ballasts.

Your fixtures sell more readily—give greater customer satisfaction—when they are equipped with CERTIFIED BALLASTS.

CERTIFIED BALLAST MANUFACTURERS

Makers of Certified Ballasts for Fluorescent Lighting

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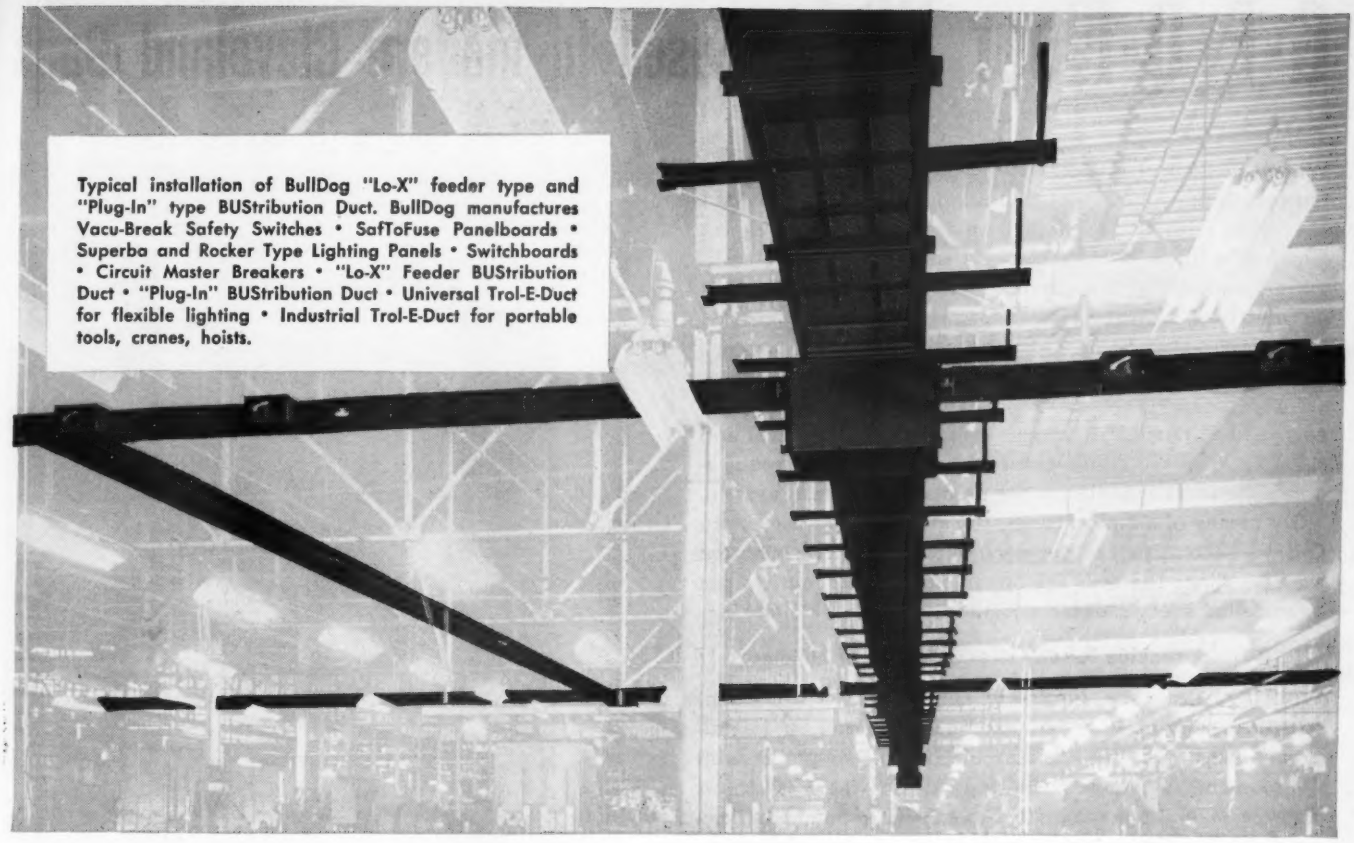


Typical installation of BullDog "Lo-X" feeder type and "Plug-In" type BUStribution Duct. BullDog manufactures Vacu-Break Safety Switches • SafToFuse Panelboards • Superba and Rocker Type Lighting Panels • Switchboards • Circuit Master Breakers • "Lo-X" Feeder BUStribution Duct • "Plug-In" BUStribution Duct • Universal Trol-E-Duct for flexible lighting • Industrial Trol-E-Duct for portable tools, cranes, hoists.

Power with a foolproof future

CAN you foresee the many changes which may come to your plant in the next five or ten years?

Naturally not! But when it comes to electrical power distribution, BullDog BUStribution systems offer flexibility to meet any change the future holds.

Take machine layout changes: With BullDog "Plug-In" BUStribution Duct, moving machinery is like moving household appliances—simply unplug machine from duct, move, and plug in at new location.

If necessary, your entire BUStribution system can be easily and quickly dismantled, moved, and set up . . . without scrapping a nut or bolt—it's flexible and salvable.

BullDog "Lo-X" BUStribution Duct, for secondary feeders, is prefabricated to exact performance standards. Ventilated construction and paired-phase arrangement of silvered-copper bus bars reduces temperature rise, assures high current-carrying capacity and reduces reactive voltage drop. BUStribution Duct is sturdily built for years of finest service.

Your local BullDog Field Engineer will be glad to show you a BullDog BUStribution system in your own neighborhood. Let him look over your requirements and answer your questions.

BullDog Field Engineers welcome the opportunity to sit in with you during the early planning stages of a building project. Their knowledge of electrical distribution layout can mean savings in installation costs, as well as efficiency and reliability in actual operation. Why not take advantage of this service?

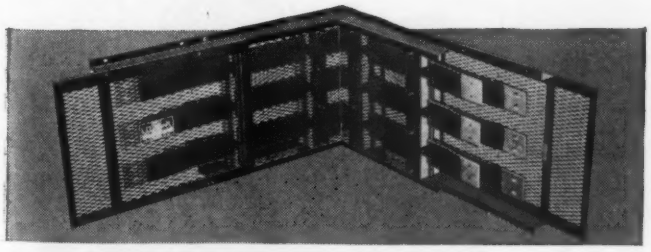
BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN • FIELD OFFICES IN ALL PRINCIPAL CITIES

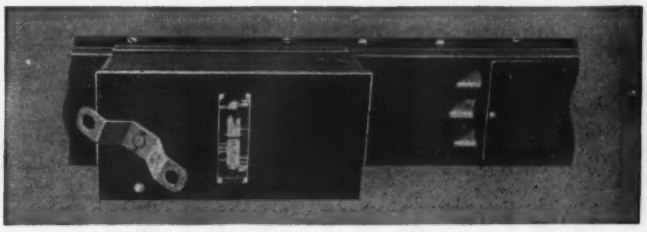
IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULLDOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION



Section of "Lo-X" BUStribution Feeder Duct, used for main secondary power feed. "Lo-X" Duct is prefabricated in ten-foot lengths, in capacities from 600 Amps. to 4000 Amps., 600 Volts or less. Close spacing and paired-phase arrangement of bus bars reduces reactive voltage drop.



Section of "Plug-In" Duct, showing Vacu-Break Bus Plug for tap-off purposes. Crescent-shaped openings make it impossible to insert plugs incorrectly. Each ten-foot section of "Plug-In" Duct has ten such openings. Capacities: 200 Amps. to 1350 Amps., 600 Volts or less.

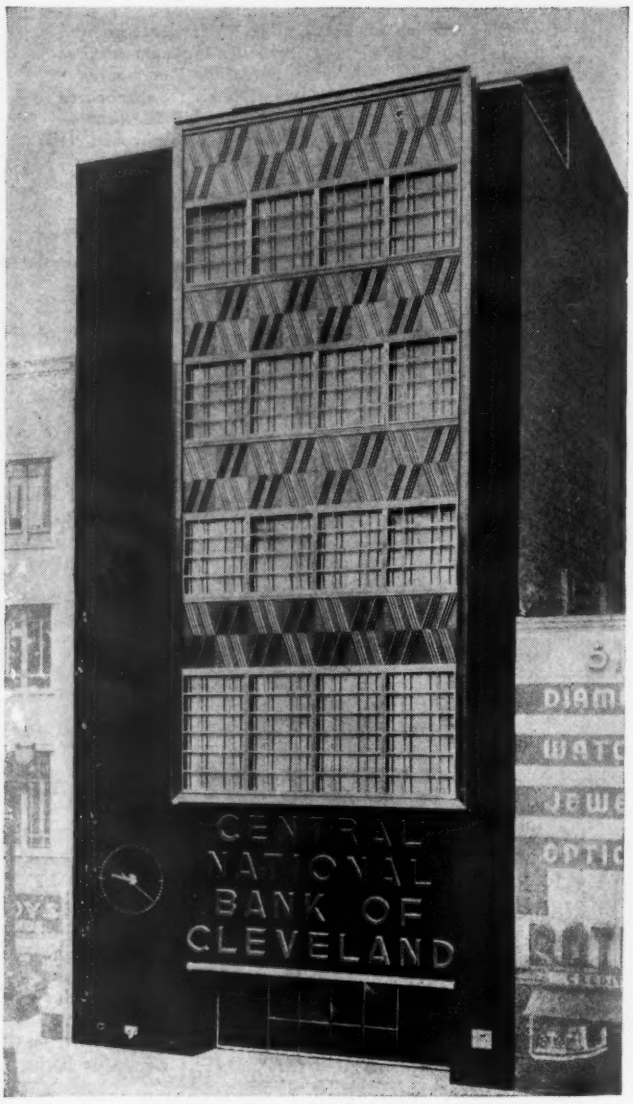
G-E Q-Floor Wiring used in modern Cleveland Bank

When the Central National Bank of Cleveland opened its fourteenth branch office at 509 Euclid Avenue, it provided Cleveland with the most modern building and the finest banking facilities possible.

Complementing its modern design, this new structure has an electrical raceway system designed to maintain its modernity – Robertson Q-Floors with General Electric Q-Floor Wiring.

This General Electric Q-Floor Wiring installation is well-equipped to handle all immediate needs for electrical and signal service. In addition, provisions for future requirements are literally built into the permanent raceway system.

By means of simple fittings, the steel cells of the entire Q-Floor become part of the electrical and signal distribution systems. Since the cells are on six-inch centers, outlets can be installed every six inches in the floor.



Q-Floors suitable for any size, any type, of building

While Q-Floors are extremely suitable for monumental structures, any building—commercial, industrial, or institutional—can be designed to stay electrically adaptable with Q-Floor and G-E Q-Floor Wiring. In fact, there is almost no type of building where Q-Floor Wiring cannot be successfully employed.

Get complete details on G-E Q-Floor Wiring

The General Electric Q-Floor Wiring story is presented in a 106-page book, "Q-Floor Wiring Data Manual." This comprehensive catalog contains descriptions, wiring diagrams, installation details, and other valuable information on this highly-flexible distribution system for architects, builders, and electrical contractors. If you would like a free copy, write to Section C16-1218, Construction Materials Department, General Electric Company, Bridgeport 2, Connecticut.

Q-Floor is manufactured only by the H. H. Robertson Company, Pittsburgh, Pa. Samples can be seen at any General Electric Construction Materials or Robertson district office.

Q-Floor with electrical headers in place. To install an outlet anywhere in the floor, it is only necessary to tap through the floor surface to the Q-Floor cell, pull wires through, and install outlet.

View of a typical General Electric Q-Floor Wiring installation in an office, showing handy signal and electrical outlets before furniture is arranged.

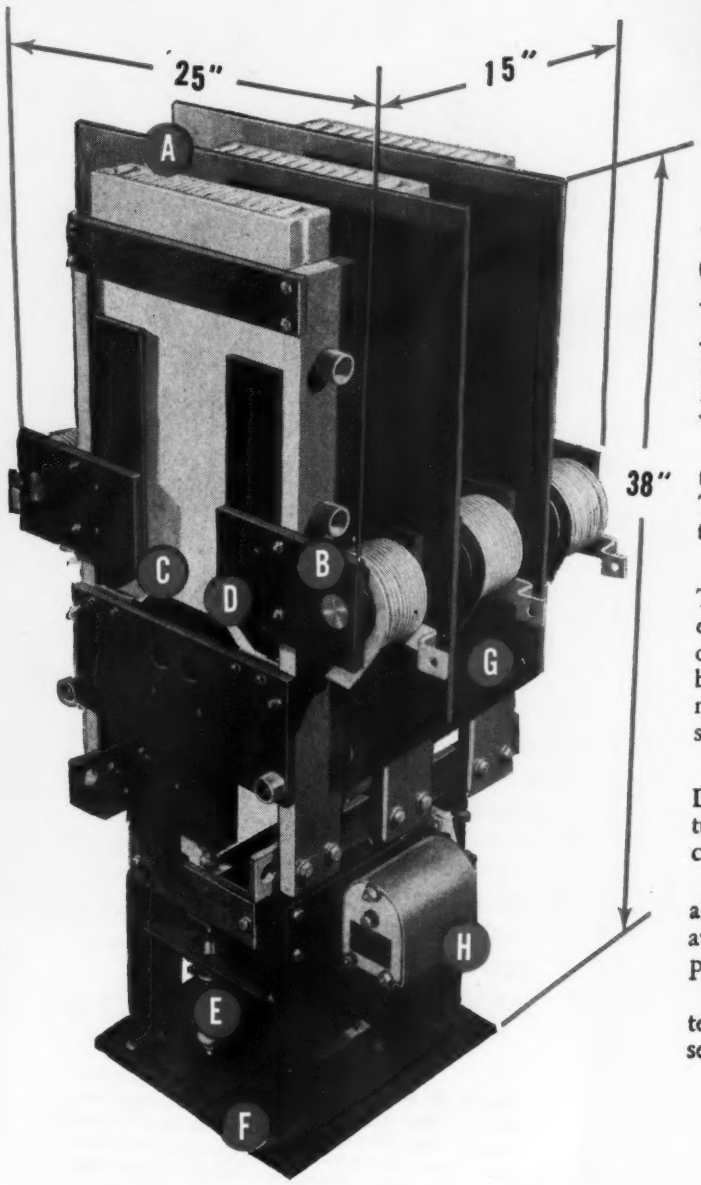
Architect: Conrad, Hays, Simpson, & Ruth
Electrical Engineer: Clyde H. Loughridge
Electrical Contractor: Martien Electric Company
General Contractor: The Hunkin-Conkey Construction Company
Manager of Building Department, Central National Bank of Cleveland: J. R. Behan

GENERAL ELECTRIC

Q-Floor Wiring
FOR ELECTRICAL FLEXIBILITY

Compact

ALLIS-CHALMERS New Replacement High Voltage Air Contactor



...INTERCHANGEABLE WITH OIL IMMERSED CONTACTORS

DON'T LET space limitations decide your replacement contactor! Investigate the new Allis-Chalmers Type 256 High Voltage Air Contactor. Measuring only 25 x 15 x 38 inches overall, it's small enough to be interchangeable with most oil immersed devices in existing motor starters.

Now you can have all the inherent advantages of air contactors, plus the extra advantage of double break contacts. This Contactor is designed for simple direct mounting on the ground plate or enclosure of your starter cubicle.

FEATURES THAT SAVE SPACE

The Type 256 Air Contactor combines three methods of arc extinction to permit its compact design. 1. Double break contacts cut arc voltage in half. 2. Dual continuous duty blowout coils snuff out low current arcs, speed the upward movement of higher current arcs. 3. Special arc chutes stretch arcs both horizontally and vertically.

FEATURES THAT INCREASE CONTACT LIFE

Double break contacts and direct vertical action eliminate turning shafts, shaft bearings and flexible contact leads . . . cut maintenance.

Movable contacts are self-aligning. Inserts of arc resistant alloy assure clean, long wearing contact surfaces. Ratings available are 200 and 400 amperes at 2500 volts, 200 amperes at 5000 volts.

Utilize the advantages of this new, compact, completely tested air contactor. Call your nearby A-C Sales Office or send coupon today.

A SPECIAL ARC CHUTES
B DUAL BLOWOUT STRUCTURE
C INTEGRAL CONTACTS AND ARC RUNNERS
D DOUBLE BREAK CONTACTS
E VERTICAL ACTION MAGNET
F EASY TO MOUNT BASE
G ACCESSIBLE TERMINALS
H MULTI-STAGE AUXILIARY SWITCH

SEND FOR MORE INFORMATION

A-2844

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

Gentlemen: Please send advance information on the New Type 256 High Voltage Air Contactor.
Name _____
Title _____
Company _____
Address _____
City _____ State _____

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

Get CORRECT CONDUIT CONNECTIONS

The easy economical way

Cross Section Showing Indentations

• NEATER • STRONGER • FASTER • APPROVED

All B-M Fittings Carry the Underwriter's Seal of Approval and Canadian Standards Ass'n Approval No. 9296

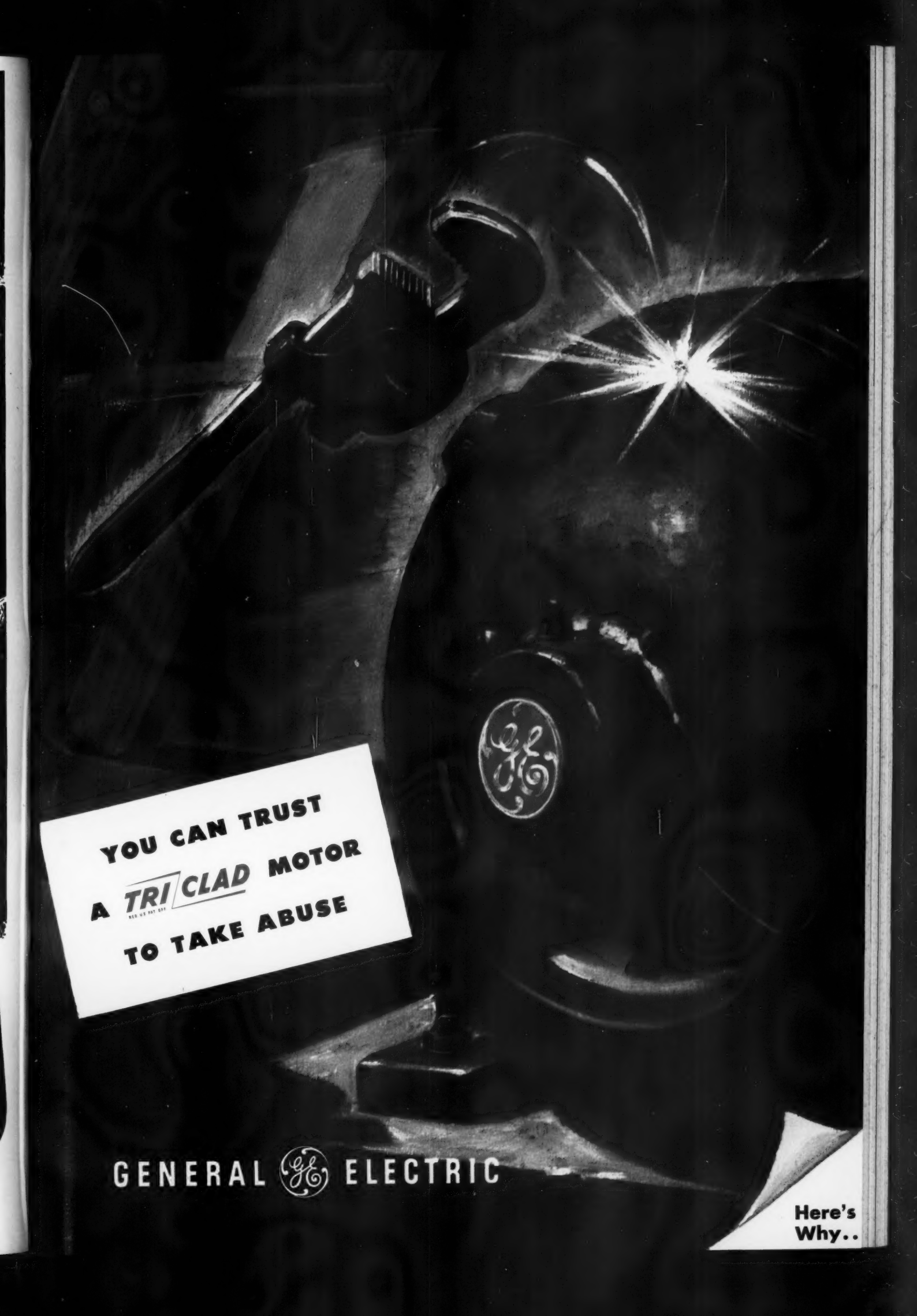
Select the best, insist on Briegel All Steel Fittings, the original approved Indenter type connectors and couplings for thin wall conduit tubing. You will not only find that Briegel Indenter Fittings are easier and faster to use, but also make neater, stronger connections, the correct connections. Two Easy Squeezes and they're set. Start using Briegel Fittings today. Have more satisfied customers—more profits from each job.

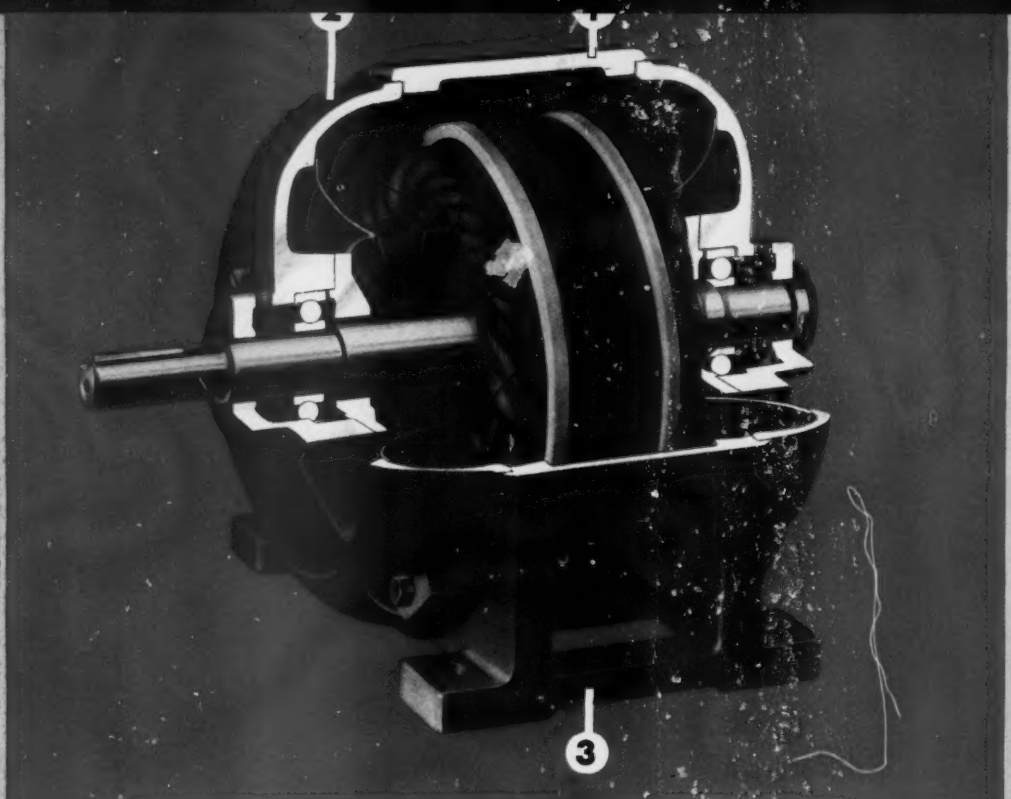
DISTRIBUTED BY

The M. B. Austin Co., Northbrook, Ill.; Clayton Mark & Co., Evanston, Ill.; Clifton Conduit Co., Jersey City, N. J.; General Electric Co., Bridgeport, Conn.; The Steelduct Co., Youngstown, Ohio; Enameled Metals, Pittsburgh, Penn.; Kondu Mfg. Co., Ltd., Preston, Ont.

BRIEGEL METHOD TOOL CO.

GALVA, • ILLINOIS


YOU CAN TRUST
A TRI CLAD MOTOR
TO TAKE ABUSE
GENERAL ELECTRIC
Here's
Why..



Notice the thick cross sections of a Tri-Clad's husky cast-iron stator frame (1) and end shields (2) . . . the integrally cast feet (3). Here you have a *rigid structural unity* that no other general purpose motor we've seen can match. Distortion of bearing alignment is well nigh impossible, even by severe blows, careless installation, or the heavy continuous radial loads some industrial drives impose. Notice, too, how Tri-Clad double-end ventilation provides *uniform* "air conditioning" throughout the motor.

You can trust a TRI/CLAD motor to take abuse

Teeth-rattling blows—accidental jarring—dripping liquids—they're all in a day's work for a Tri-Clad motor—the toughest general-purpose motor that hard-headed plant management can buy.

The cast iron structure which today protects more than a million and a half Tri-Clad motors, is one big reason for its stamina. It absorbs the shock of accidental blows and falling objects encountered in rigorous industrial service. It provides vastly superior resistance to rust and corrosion. Moreover, cast iron won't take on an injurious permanent "set"; thus it assures accurate shaft alignment and a permanent air-gap for the life of the motor. Thick-ribbed cast-iron end shields, too, take more than their share of punishment.

Want to standardize on a line of motors that can really **TAKE ABUSE?** Local stocks of Tri-Clad motors in your area mean **QUICK DELIVERY.** *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

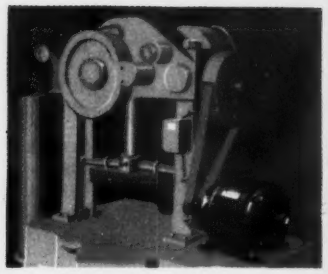
GENERAL ELECTRIC

YOU CAN'T BEAT

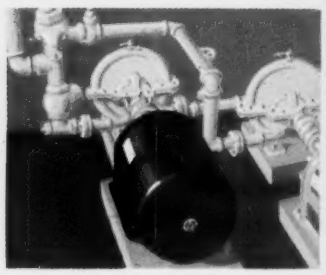
TRI/CLAD

REG. U.S. PAT. OFF.

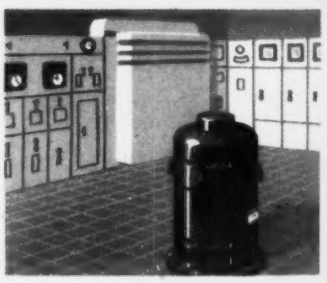
EXTRA PROTECTION



G-E open (dripproof) induction motors for constant-load, constant-speed applications. From 1 to 2000 hp.

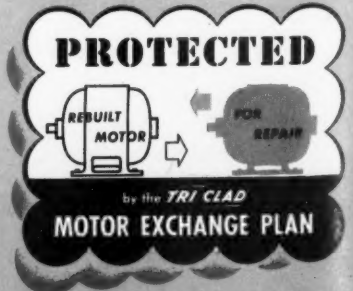


G-E totally enclosed motors for outdoor operation, in abrasive dusts, or corrosive fumes. From 1 to 1000 hp.



G-E vertical induction motors for pump drive, in streamline design. From 1 to 500 hp.

G-E capacitor motors for use on fans, blowers, pumps and compressors, with single-phase power. From ¾ to 5 hp.

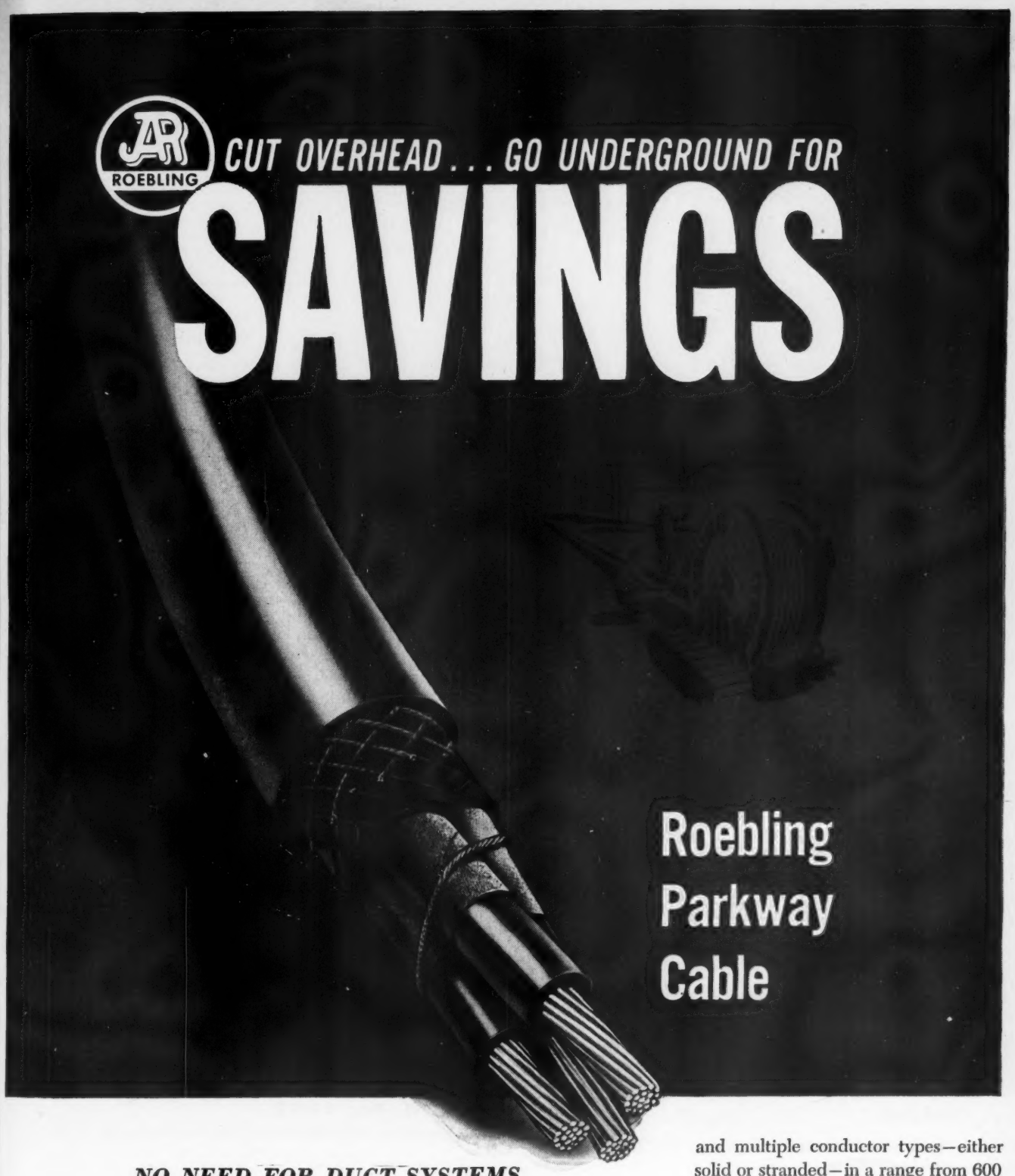


Look for this EXTRA on the motor you buy!

JR ROEBLING

CUT OVERHEAD . . . GO UNDERGROUND FOR

SAVINGS



NO NEED FOR DUCT SYSTEMS

ROEBLING PARKWAY CABLE is laid directly in the ground. No complicated and costly duct systems . . . a trench only two or three feet deep is ample and economical. Once installed, you can count on Roebling Parkway for trouble-free and uninterrupted service.

You have the choice of Roebling Parkway Cable with metallic armor or with a non-metallic, roeprene sheath that affords dependable physical protection. Both can be supplied in single and multiple conductor types—either solid or stranded—in a range from 600 to 5000 volts.

Your nearest Roebling distributor or Roebling office will be glad to help you select the best cable for your particular requirements. Call on them for any desired assistance. John A. Roebling's Sons Company, Trenton 2, New Jersey.

WRITE OR CALL THE ROEBLING FIELD MAN AT YOUR NEAREST ROEBLING OFFICE AND WAREHOUSE

Atlanta, 934 Avon Ave. ★ *Boston*, 51 Sleeper St. ★ *Chicago*, 5525 W. Roosevelt Rd. ★ *Cleveland*, 701 St. Clair Ave., N. E. ★ *Denver*, 1635 17th St. ★ *Houston*, 6216 Navigation Blvd. ★ *Los Angeles*, 216 S. Alameda St. ★ *New York*, 19 Rector St. ★ *Philadelphia*, 12 S. 12th St. ★ *Pittsburgh*, 855 W. North Ave. ★ *Portland, Ore.*, 1032 N. W. 14th Ave. ★ *San Francisco*, 1740 17th St. ★ *Seattle*, 900 First Ave.

ROEBLING

☆ *A CENTURY OF CONFIDENCE* ☆

P-G STEEL GRID *Resistors . . .*

for HEAVY DUTY APPLICATIONS:

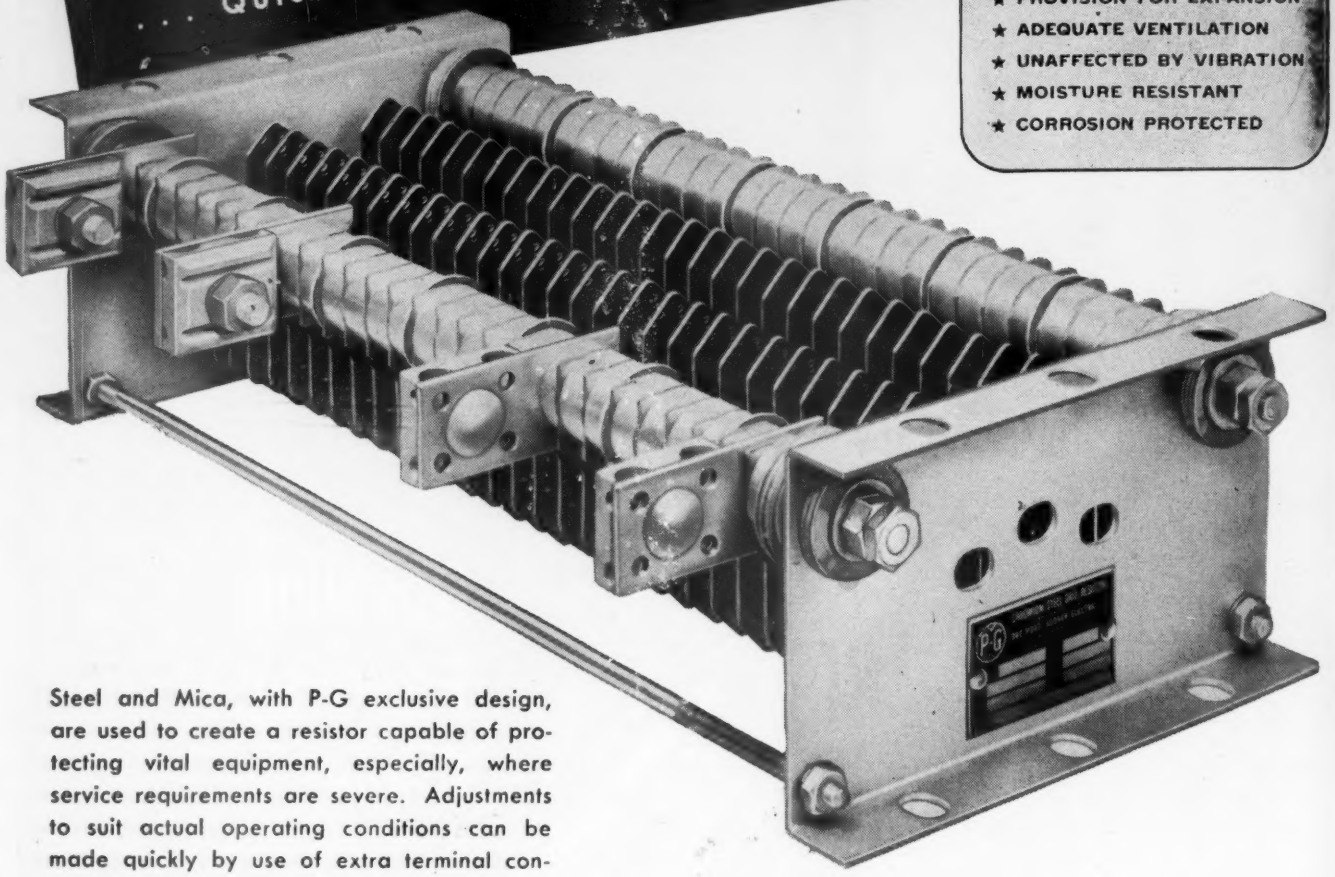
. . . . Built for severe service conditions

. . . . Protect vital electrical equipment

. . . . Constant "Trouble Free" performance

. . . . Quick adjustments easily made

- ★ ALL STEEL CONSTRUCTION
- ★ MICA INSULATION
- ★ RUGGED TERMINALS
- ★ PROVISION FOR EXPANSION
- ★ ADEQUATE VENTILATION
- ★ UNAFFECTED BY VIBRATION
- ★ MOISTURE RESISTANT
- ★ CORROSION PROTECTED



Steel and Mica, with P-G exclusive design, are used to create a resistor capable of protecting vital equipment, especially, where service requirements are severe. Adjustments to suit actual operating conditions can be made quickly by use of extra terminal connections usually available. Try P-G Resistors for constant "*Trouble Free*" performance.

BULLETIN No. 500C
Gives detailed information . . . Copy on request.

P-G

The Nonfreezable Steel Grid Resistor

THE POST-GLOVER ELECTRIC COMPANY

• ESTABLISHED 1892 •

221 WEST THIRD STREET, CINCINNATI 2, OHIO

A completely rebuilt motor is tested with dynamometer. This machine applies low voltage and overloads exactly as in actual usage.

Complete Facilities

KEEP ELECTRIC MOTORS ON THE JOB

California Electric Works, San Diego, features modern equipment, large stock of parts, 2 shift operation, 24 hour service in emergencies to give top-flight Allis-Chalmers Certified Service

IN SAN DIEGO, and *every* major industrial center in the United States you will find an outstanding, independent Allis-Chalmers Certified Service shop.

These shops have been carefully picked for their experience, highly skilled workmen, modern equipment and business reputation. Each uses nothing but factory approved methods and parts.

So when you need service on electrical equipment, call the nearest Allis-Chalmers Certified Service shop. You can be sure of fine workmanship, fast service and fair prices.

GOOD SOURCE FOR NEW MOTORS, TOO

Your Allis-Chalmers Certified Service Shop or Authorized Dealer can give you the same fast, dependable delivery on new motors. Whichever you need, new motors or service on your present equipment, you can depend on your Allis-Chalmers Certified Service shop. A-2885

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE, WIS.

Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.

PUMPS — Integral motor and coupled types. Sizes and ratings to 2500 GPM.

Texrope and *Vari-Pitch* are Allis-Chalmers trademarks

ALLIS-CHALMERS

BOTH CARRY 390 AMPS.

BUT ROCKBESTOS

A.V.C.®

IS 43% SMALLER

With higher-rated A.V.C. and a 390 ampere load INSTALLED COSTS ARE LOWER*—

- you use a 400 MCM cable *not* 700 MCM
- you use 3″ conduit *not* 3½″
- you use *smaller* fittings and lugs
- you have *lower labor costs* because smaller, lighter cable and conduit are quicker and easier to handle.

Size for size A.V.C. has a HIGHER AMPERE RATING

Hi ... YOUR BEST BUY

Permanently-insulated Rockbestos A.V.C. can save you money. Write for the booklet "Cut Current Carrying Costs."

*Comparison with Type RH based on Chapter X—National Electrical Code, 40°C-104°F Ambient

ROCKBESTOS A.V.C.

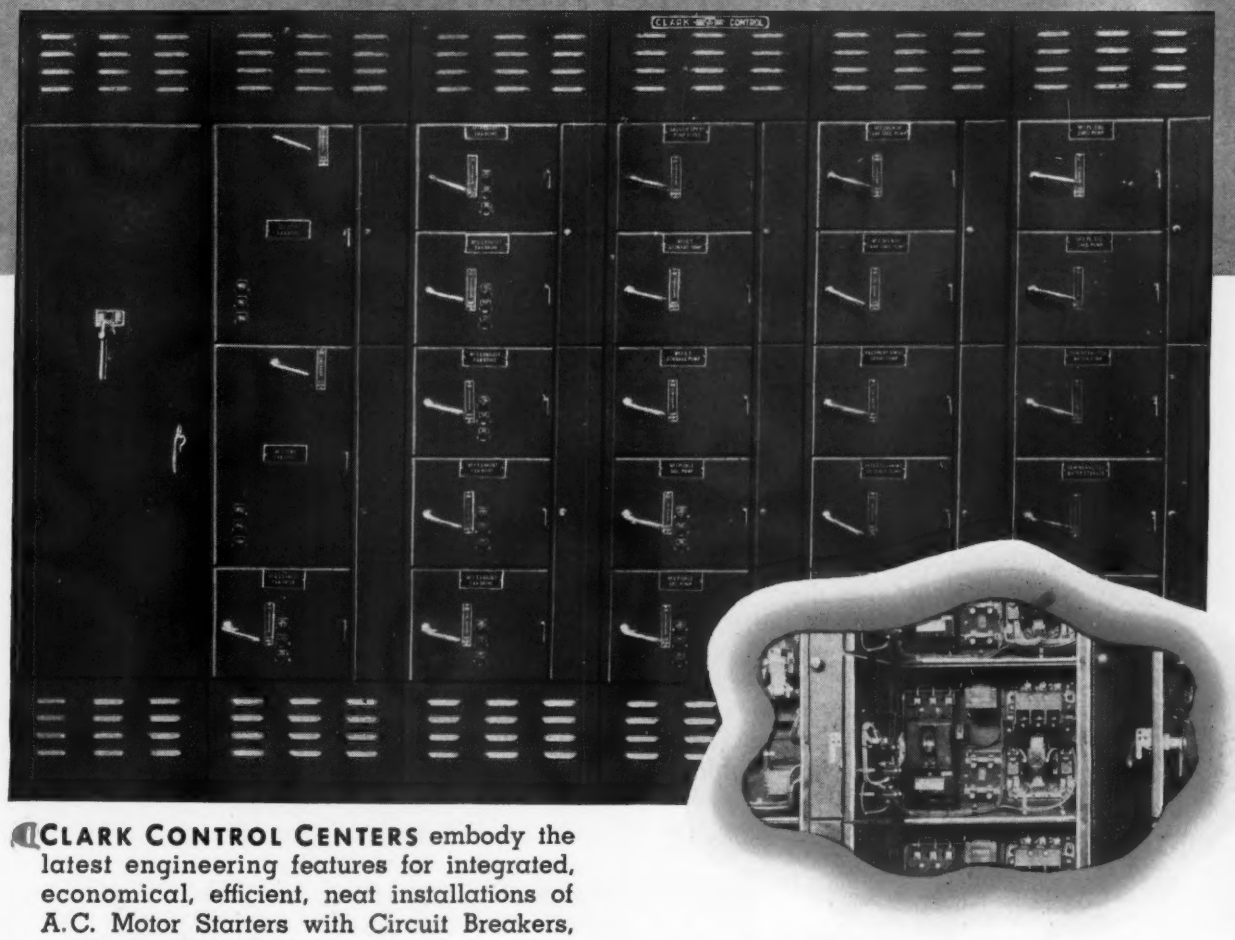
ROCKBESTOS PRODUCTS CORPORATION
New Haven 4, Connecticut

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH
ST. LOUIS • LOS ANGELES • OAKLAND, CAL.

Presenting . . .

CLARK CONTROL CENTERS

New! Modern! Efficient!



CLARK CONTROL CENTERS embody the latest engineering features for integrated, economical, efficient, neat installations of A.C. Motor Starters with Circuit Breakers, or Fusible Disconnect.

Each section is 90" high, 24" wide, and 20" deep, and all sections can be arranged in any angular pattern to meet floor space requirements. Additions to existing installations are easily made.

The 24" width has the definite advantage of supplying liberal wiring space for all units. For starters up to and including Size 3, a 6" wiring trough with hinged door is provided.

Units are 13" high, or a multiple thereof. Each section accommodates any combination of starters (Sizes 1 through 5) totalling 65" in height. Rearrangements are easily made at any time.

Close-up view of Size 2 Starter and Circuit Breaker.

Louvres, top and bottom, provide adequate ventilation, and avoid accumulative heating.

Units are "plug-in" type, easily removed.

Load and control leads, and horizontal line bus can be placed in either the top or bottom and can be interchanged.

The control equipment and wiring troughs are accessible from the front, by simply opening a door.

Vertical sections are mounted on a common floor channel for rigidity and perfect alignment.

For full details ask for Bulletin 6200

Contact your nearest Clark Distributor

ENGINEERED ELECTRICAL CONTROL

THE CLARK CONTROLLER CO.

1146 EAST 152ND STREET, CLEVELAND 10, OHIO

OVER A MILLION INSTALLED KVA

in Westinghouse

Dry-Type Power Centers

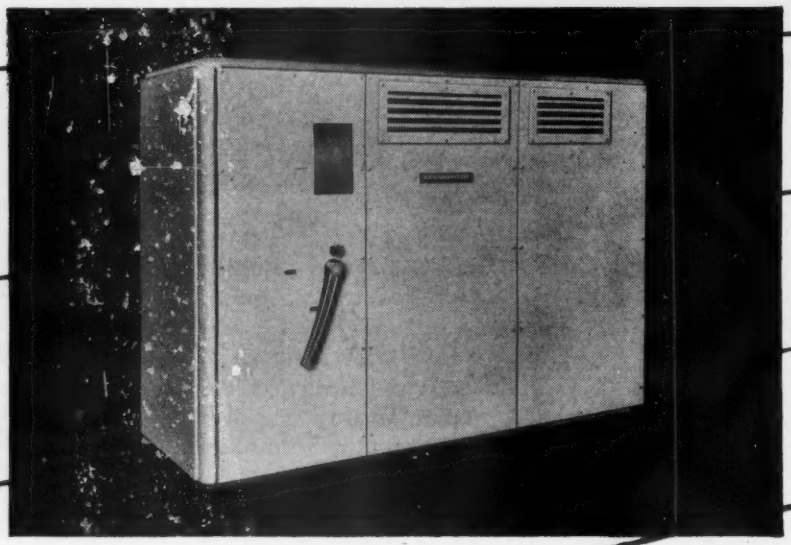
"A million installed kva" in itself is not important. What is important is that these modern Dry-Type Power Centers are doing an efficient job . . . a job of meeting today's production problems by providing *dependable* and *economical* distribution of power.

They combine the necessary high-voltage switching equipment, a dry-type transformer, low-voltage switchgear and the necessary auxiliaries into a compact, completely enclosed and fully co-ordinated unit.

Their "Unitized" design permits the addition of feeders as required by changes in the load. They can be installed quickly and at low cost . . . *near the load center.* This reduces losses and improves voltage regulation. Long runs of costly copper are eliminated. Add to this the other advantages of Dry-Type Power Centers . . . fire and explosion-proof . . . no vaults required . . . lighter weight. These are the reasons it will pay you to investigate modern Dry-Type Power Centers for your distribution systems.

Modern Westinghouse Dry-Type Power Centers can be supplied for use in any distribution system whether radial or network . . . where the high voltage is 15 kv and below. CONSULT WESTINGHOUSE. Call your nearest Westinghouse office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-97135



Indoor Dry-Type Power Center with primary switch and built-in panelboard.

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

What is YOUR power distribution problem?

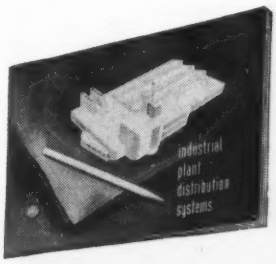
The importance of a power distribution system in an industrial plant makes it almost imperative that the *best system* be selected and included in the very basic planning for expansion or new building.

The problems of power distribution vary greatly from plant to plant. Meeting these problems for widely diversified industries has given Westinghouse an intimate knowledge of fields that undoubtedly closely touch *your* problem. Westinghouse offers complete cooperation to all industries in searching out better answers to all phases of the distribution and application of power.

★ ★ ★

Write for the new booklet "Industrial Plant Distribution Systems"

If you're considering expanding or building a plant, you'll find this booklet invaluable in choosing a distribution system that best meets *your* requirements. Ask for B-4045.



A Dry-Type Secondary-Network Power Center installed in a large mid-western industrial plant. Note it is located in the immediate load area which it serves.

MODERN EQUIPMENT FOR MODERN DISTRIBUTION SYSTEMS

Put DRY-TYPE TRANSFORMERS in Load Areas

- Reduce Power Consumption
- Improve Machine and Lighting Efficiency
- Increase System Flexibility
- Reduce Cable Installation Costs

IN THE PLANT LAYOUT above, note the effective use of dry-type transformers. Installed at load centers, they eliminate long secondary runs, thus minimize distribution losses and improve voltage regulation. This in turn means stepped up machine and lighting efficiency.

To get these advantages for your system, specify Allis-Chalmers dry-type transformers. These safe, compact units give you the *additional* advantages of 1) faster hookup by means of clamp type connectors or convenient drop out plates, 2) *Spra-Bonderized* rust protection, and 3) heat-and-moisture-resisting *Fiberglas* insulation which cuts down size and weight, makes for easier mounting *anywhere*. Ratings from 1½ to 300 kva.

For full information, contact your local A-C sales office. Or write for bulletin B6382.

A-2806

ALLIS-CHALMERS, 930A SO. 70 ST.
MILWAUKEE. WIS.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

NOW...in midget size

Sectional view showing bus in position
Feedin Box 2 or 3 pole
Plugin Outlets spaced on 20-inch centers
Hanger
Plugin Device 2 or 3 pole
End Closure

the NEW FA POWER PLUGIN

THE COMPACT *MIDGET SIZE* PLUGIN (FA) BUSDUCT

Designed for

50 AMP., 240 VOLT MAXIMUM FEEDER CAPACITY, AND ½ to 3 HP MOTORS

(7½ HP MAXIMUM WITH DUAL-ELEMENT FUSES)

The PLUG-IN convenience, flexibility and efficiency of Plugin (FA) Busduct is now available in *midget* size . . . 50 Amp., feeder capacity . . . for equipment requiring connections for ½ to 3 HP motors, 240 volts or less AC or DC . . . 7½ HP maximum, with dual element fuses.

(FA) POWER PLUGIN provides convenient plugin outlets all along the line. Approved by Underwriters' Laboratories, the duct is made in 5-foot and 10-foot sections with plugin outlets every 20 inches . . . additional outlets on special order. Special lengths are available for application on production benches and machines.

Midget PLUGIN UNITS, fitted with standard 30 Amp. capacity fuse connections, serve as excellent disconnect devices for the power feeder to the motor . . . permitting production machines to be moved in or out of the production line without slowing down or delaying plant production.

(FA) POWER PLUGIN's midget size (3 inches wide by 2 inches deep) provides a new flexibility in power distribution for even greater production efficiency.

You'll find much more information in our new Bulletin No. 703. We will gladly send it to you.

Frank Adam Electric Co.

ST. LOUIS 13, MISSOURI

Makers of **BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKMETER**

What Does
RACO Mean?
RACO (rā'co) 1. The top line of steel switch and outlet boxes. 2. Quick, easy installation for contractors. 3. Dependability for architects. 4. Customer preference and steady demand for jobbers.
You don't need a dictionary to find out what RACO means to the electrical trade. The RACO Line is approved by the Underwriters' Laboratories, Inc. Contractors prefer the well known RACO quality. Architects specify the reliable RACO Line. Wholesalers enjoy the profitable repetitive volume.
You can always rely on RACO
RACO
ALL-STEEL PRODUCTS
ALL-STEEL EQUIPMENT Inc.—800 Kensington Ave., Aurora, Illinois
"A BOX FOR EVERY NEED"

DECEMBER . . . . at a Glance

Business Control

It seems like the only way to make up for taking business at a loss is to build volume. Ridiculous as that old wheeze may seem, there are surprising numbers of electrical contractors who are almost as uncritical in setting up business operation budgets. Ralph E. Johnson, vice president and general manager of Sturgeon Electric in Denver has developed out of long experience and keen insight, a new approach to the problem of budgeting and controlling an average all-round electrical contracting business operation using man-hours as the yardstick. This element, the most risky cost-wise, is still the most critical through the years in determining other management and overhead costs. "A New Look Into Your Business Progress" begins on page 40.

Wet Works

The operation of ordinary electrical apparatus that consistently consumes large amounts of energy in damp and wet locations is fairly well understood. The penalty for ignorance is blown fuses, burned out motors and expensive rewiring. Such prompt reactions do not always show up on signal systems. But ultimate trouble is just as certain if system design does not allow for good protection of components and wiring from the effects of moisture. A. A. Schuhler discusses some typical problems and solutions in his article "Signals for Wet Locations" on page 46.

NECA

Few meetings of the National Electrical Contractors Association have inspired the keen interest of the sessions last month in Houston. A contest for the top office wound up in true democratic style with harmonious welcome to new President Ed Vanderlinde of Rochester. H. L. Scott of Corpus Christi let loose with a challenging electrical modernization program, Harry Simmons nailed down ten major developments that will take all the industry can muster in aggressive sales promotion tactics. Backing up business promotion were programs for personnel training, much needed research, and good reports of sound and constructive organization growth and management. Alice McMullen's notebook caught the program highlights for the text of our annual NECA convention report. Gus Eckel's camera in the meanwhile was busy rounding up folks from everywhere. A few of the best shots (we couldn't possibly squeeze all of them in) were finally selected to show a representative cross section of the 1200 delegates and guests who enjoyed the hospitality and enthusiasm of Houston. The story leads off our feature section beginning on page 33.

Transformer Repairs

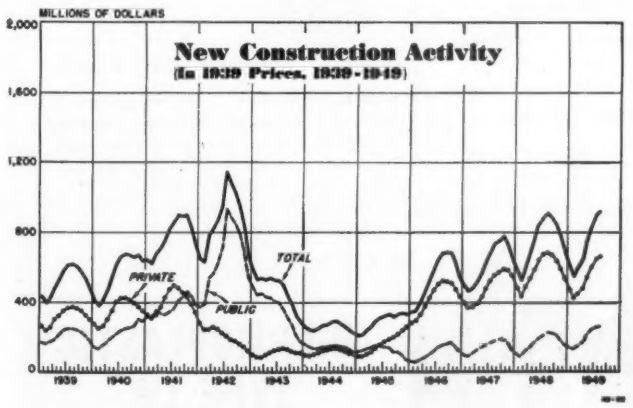
Ten years ago Dowzer Electric Construction Company in Mt. Vernon, Ill. set up a small electrical equipment repair division to help its customers in the surrounding area. Today Dowzer Electric Machinery Works has superseded the construction division and has a transformer repair department that accounts for most of the annual business volume. This volume was built on a strong combination of good management, high technical standards and efficient shop operation. For a detailed picture story of this unusual shop see "Specializing in Transformer Repairs" on page 43.

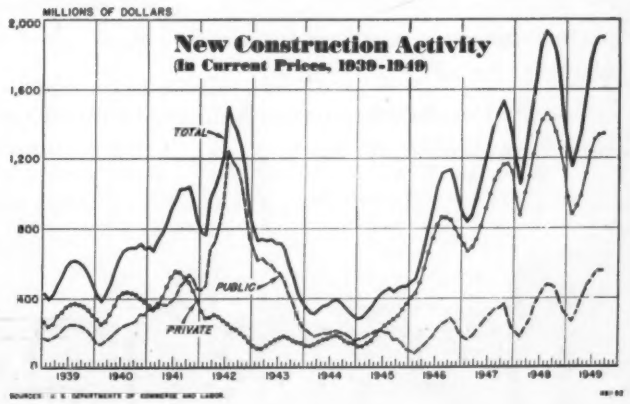
Lower Costs

Our series of articles on Higher Productive-Lower Costs (see page 48 in this issue) has stimulated considerable interest and large quantities of extremely useful material. In the series so far we have been able to use only a small portion of the material received. We hope we'll get to most of it in future articles. In the meantime we want to express our appreciation for the fine and valuable cooperation and comments we have had from many of you on this project.

Construction Outlook

In spite of many sharp bumps in the economic pattern this year, preliminary estimates of the Department of Commerce indicate that construction volume in 1949 is going to run ahead of 1948 and that 1950 will probably equal this record year, with less private but more public construction.





PROTECTION

ANACONDA
from mine to consumer
REG. U.S. PAT. OFF.

DENSHEATH, the Anaconda thermoplastic Type TW building wire, gives you the maximum in *protection.*

One of Densheath's important advantages is its protection against cutting and abrasion. Pull it hard over the sharp edge of an outlet box. The chances are you won't even dent the tough insulation. More protection: Densheath will not burn . . . is long aging . . . impervious to acids, oils and alkalis . . . has low moisture absorption.

Densheath protects profits, too: time is saved on the job by its special, slick finish for easy fishing . . . light weight for light work . . . permanent, bright colors for quick circuit identification . . . small diameter for more wires in a conduit.

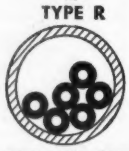
Specify Densheath. Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U. S. Pat. Off.

THE DENSHEATH ADVANTAGE IN REWIRING WORK

3 #10 Wires permitted in ½" conduit

TYPE R



6 #10 Wires permitted in ½" conduit

TYPE TW (ANACONDA DENSHEATH)

National Electrical Code recognizes Densheath for circuits to 600 volts, temperatures to 140° F., and for wet and oily locations.

Densheath*

THERMOPLASTIC TYPE TW BUILDING WIRE

DESTRUCTIVE BIDDING

OVER 85 PERCENT of the lighting in the average American city is inadequate. The Industrial and Commercial Lighting Equipment Section of NEMA uncovered this challenging statistic in an independent market research study made in Indianapolis, Indiana. And that city is about 13 percent better than the national average in lighting fixture sales.

FROM ANOTHER CITY we have a commentary on bidding for electrical work on some outlying school projects. The bidders are now competing by undercutting previous low bids on like projects. Apparently all attempts at precise estimating and analysis have been abandoned for a destructive price battle. Highly efficient electrical construction organizations in the community which would be most likely to be able to spare costs and eke out some meager margins are not even on the list of bidders.

AT A TIME when the electrical construction industry is facing critical decisions, these phenomena present two facets of one major problem. It is not unique in this industry. It is wide spread and chronic. It could be called the principle of "minimum market exploitation", which is a pedantic way of describing the process of seeking the customer's dollar through selling the least amount of products and services he will buy at the lowest possible price.

MINIMUM MARKET exploitation and price competition are weapons of weak initiative in a declining economy. Its appearance now is probably temporary. The outlook in construction and installation is optimistic and expanding. The challenge of the Indianapolis survey is only one of many market opportunities ultimately the responsibility of the electrical construction industry through the efforts of individual electrical contractors. But so long as energy is sapped and policy warped by destructive price competition there can be little prospect for effective marketing. They are mutually contradictory.

THE ONLY ANSWER is in a break with some of our industry traditions and practices. What other service or product with such an infinite range of quality variation is bought solely on price? The most precise specification policed by the most competent architectural supervision cannot inspire the ingenuity and imagination of our most able and experienced electrical men. Is the lowest price the greatest value? Not in any other progressive industry.

THE CHALLENGE of the Indianapolis survey which means that customers need more and better service than we have yet learned how to sell gives the answer to the principle of destructive bidding. The public needs and wants more from our industry than minimum market exploitation. The future of our economy needs adequate wiring, proper and effective lighting and a host of other benefits of electrical utilization. Destructive price competition blocks the way. To isolate and insulate the more progressive elements of the industry from its effects is the most important project the past year's experience has placed before the electrical construction industry.

Wm. F. Stuart

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That's true whether you're installing light in plants, offices, stores, or out-of-doors. For Graybar has the biggest selection of lamps and lighting units available anywhere. Graybar Lighting Specialists have studied, planned, and supplied lighting systems of every conceivable type. That's why they can impartially recommend the best equipment for any illumination need. For an up-to-date guide in planning your lighting jobs, mail the coupon below.

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Graybar distributes all types and sizes of G-E lamps — fluorescent, filament, mercury — clear, frosted, colored — glow lamps, heat lamps, germicidal lamps, flashlight lamps. Stocks are maintained at Graybar's more than 100 warehouses throughout the nation for prompt delivery anywhere.

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In addition to the materials needed for *any* lighting job, Graybar can provide all the tools and supplies for wiring, communication, ventilation, and other electrical installations. All are first-quality products of leading manufacturers.

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Please send me free a copy of your 84-page book, "Planned Commercial Lighting."

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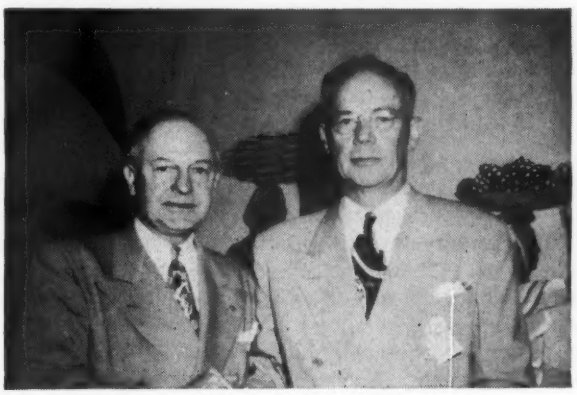
City_____ Zone____ State_____

FIRST GENERAL SESSION *of the convention of the National Electrical Contractors Association in Houston, Texas, November 8-11.*

NECA *Convention Report*

NECA launches business promotion campaign, inaugurates new "vestibule training" program at convention in Houston, Texas. E. J. Vanderlinde elected president.



Retiring NECA president, Robert W. McChesney, Washington, D. C., welcomes newly elected president Edward J. Vanderlinde, Rochester, N. Y.

MORE than 1,200 electrical contractors from all parts of the United States attended the 1949 annual convention of the National Electrical Contractors Association at the Rice Hotel, Houston, Texas, November 8-11. The theme of this year's convention was "Selling," and most of the program was devoted to shifting emphasis in the industry from obtaining business solely through competitive bidding to building business through creative selling.

An industry-wide educational program to acquaint the public with the need for electrical modernization was presented by the Business Promotion Committee and adopted by the convention. A NECA "Vestibule Training" Program, to provide instruction and training for contractors and their personnel in the business of electrical contracting also was adopted. The course is intended to train young men coming out of colleges and technical schools, in basic knowledge of application engineering, estimating, cost accounting and sales engineering in the specialized field of electrical construction and installation.

Edward J. Vanderlinde of the Vanderlinde Electric Corp., Rochester, N. Y., was elected president of the Association. He succeeds Robert W. McChesney of Washington, D. C., who has been president of NECA since 1939. Other officers elected were W. E. Frazer, Philadelphia, vice president of District 2; Leon J. Granger, Hammond, Ind., vice president of District 5; J. D. O'Connor, Sacramento, Calif., vice president of District 6; and J. E. Collier, Denver, Colorado, vice president of District 8.

President's Address

Retiring President Robert W. McChesney, said that the electrical contracting industry can serve itself and the public best by advising on and selling its customers the necessity of having the best possible modern electrical systems.

The United States, he stated, is just entering the electrical age, and industry, commerce and individuals deserve to have the best possible installation so that the full value of its

NECA district vice-presidents elected at Houston convention: (L to R) J. E. Collier, Denver, Colo. (Dist. 8); W. Edward Frazer, Philadelphia, (Dist. 2); J. D. O'Connor, Sacramento, Calif., (Dist. 6); Leon J. Granger, Hammond, Ind., (Dist. 4).

J. M. Richardson, Richardson-Wayland Electrical Corp., Roanoke, Va.; J. Roland Stolzenbach, The Roland Electrical Co., Baltimore, Md.; William J. Wheeler, Mainco Contracting Corp., N.Y.C.; C. L. Teal, Knight Electric Co., Birmingham, Ala.

J. A. Scheffer, manager, Nashville Chapter, NECA, Nashville, Tenn.; H. G. Miller, Miller Electric Co., Jacksonville, Florida.

D. B. Clayton, Electric Constructors, Inc., Birmingham, Ala.; A. L. Stone, Stone Electric Supply Co., Los Angeles, California.

W. B. Schnorbus, W. B. Schnorbus Electric Co., Houston, Texas; Charles Scholibo, manager, Southeast Texas Chapter, NECA, Houston.

source of light, heat and power can be realized.

Mr. McChesney gave an accounting of ten years of progress in the industry. He described the present status of the readjustment in the electrical industry as akin to a "cold war." It is necessary, he continued, to work out these readjustment problems quickly so that the public can get the full benefits of the industry's cooperative efforts.

"We have won the 'hot war' of production," he said. "Let us prepare now, and keep everlastingly prepared, to win the battle of the 'cold war'—the battle of distribution."

Mr. McChesney said that the electrical contracting industry is making the strongest effort to correct its fundamental weakness—its lack of selling. Electrical contractors can best accomplish their sales objectives by selling the results of electricity and not just pipe and wire. He suggested that the industry's "Electrical Modernization Program" be concerned with showing the industrial plant manager how many more units he can produce with the same amount of electricity when it is properly applied; with showing the store manager the effect on sales of a properly planned lighting system, and with showing the home owner why a well-planned and adequate electrical system is necessary.

"There is nothing wrong with the electrical contracting industry that good salesmanship will not correct," he pointed out.

McChesney reported that the electrical contracting industry has emerged in ten years from a struggling industry doing an annual business of two or three hundred million dollars to a major industry of small businessmen doing an aggregate annual volume of more than $1,500,000,000.

To accomplish this advance, he said, those who would eliminate the electrical contractor as a specialist in the building and construction industry had to be defeated, and propaganda stopped.

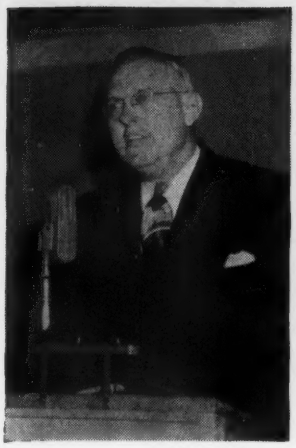
Business Promotion Program

The Business Promotion Committee recommended as a major part of the Association's program for 1950 an industry-wide educational project to develop business through constructive selling.

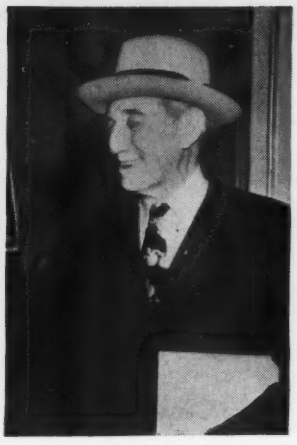
Explaining the objective of the NECA Electrical Modernization Program, H. L. Scott of Corpus Christi, Texas, chairman of the NECA Business Promotion Committee said:

"Not one home out of ten is properly equipped to take advantage of modern electrical living. Not more than one shop or office in 25 is able to deliver the maximum electrical service possible. Only one factory in 50 can take full advantage of electrified production.

"The American public deserves a better electrical break than this. It is up to the electrical contracting industry which provides the application engineering for electricity in all of its forms to see that the public under-



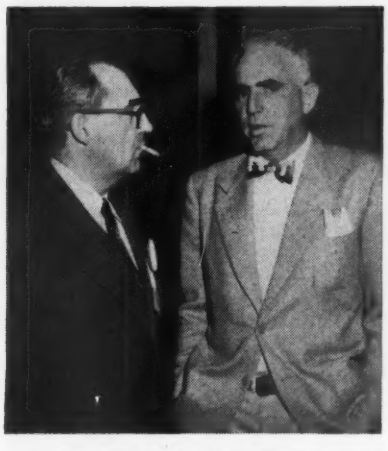
Dr. John R. Steelman, Assistant to the President of the United States.



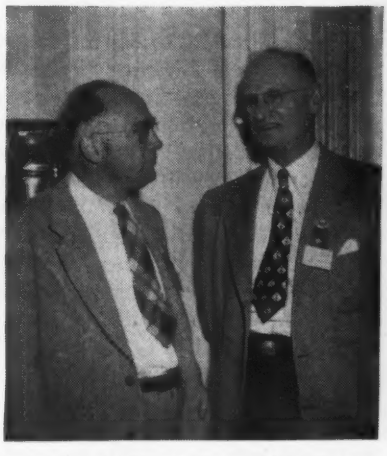
D. W. Tracy, International President, I.B.E.W., Washington, D. C.

W. P. Cagney, Jr., Contracting and Material Co., Evanston, Ill.; W. W. Giesen, Electrical Contractors, Inc., Chicago; E. E. Leasure, Jr., Monroe Electric Co., Chicago; Fred Stocek, Hoffman Electric Co., Chicago.

E. J. White, Edw. J. White Co., Inc., Newark, N. J.; Efrem A. Kahn, E. A. Kahn & Co., Jamaica, L. I., NECA Labor Relations.



F. E. Keith, Keith Electric Construction Co., Des Moines, Ia.; Oliver F. Burnett, Jr., Kelso-Burnett Electric Co., Chicago, Illinois.



George Andrae, Herman Andrae Electric Co., Milwaukee, Wis.; E. R. Hansen, Meade Electric Co., Inc., Chicago, Illinois.

stands the need for a good electrical highway back of the receptacle."

The NECA Electrical Modernization Program is designed to promote electrical adequacy in all of its applications. All branches of the electrical industry are being asked to participate in this program. NECA will undertake to sponsor a specific program of modernization of industrial and commercial installations.

Another proposal of the Business Promotion Committee was a recommendation that every NECA Chapter and every member adopt the NECA Guarantee Certificate Program, under which the electrical contractor issues each customer a written warranty good for one year during which any failure in an electrical installation due to faulty material or workmanship will be replaced without cost to the customer.

The Committee also announced a Chapter Promotional Program for 1950 which involves, at the discretion of each of NECA's 85 chapters, a local promotional and advertising program on a monthly basis.

Harry Simmons, management consultant of New York City, discussed ten major developments, each of which require the services of the electrical contractor:

(1) Atomic energy as applied to science, industry and medicine.

(2) Amazing expansion in television, radar and facsimile transmission.

(3) Astonishing new developments in aviation, including new planes, new airports, new routes and schedules, and new safety devices.

(4) Greatly increased automobile, bus and truck transportation.

(5) Widely-expanded express highways, new surfaced highways, and second-story express highways in congested areas and the lighting thereof.

(6) Universal year-round air conditioning—cooling, heating, ventilating, insulating and noise elimination.

(7) New housing projects; new commercial, industrial and institutional construction, and new civic projects.

(8) Rural electrification, rehabilitation and modernization.

(9) New railroad equipment—electric and diesel locomotives; new coaches, new Pullmans, freight cars, and new streamlined trains.

(10) A tremendous expansion in the use of plastic and other lightweight materials and products.

"It is up to you to sell your way into all of this prosperity," Mr. Simmons said. He gave seven keys to developing profitable business from these opportunities. They are: personal selling; direct mail selling; advertising; sales promotion; repeat business; customer relations; and community relations.

The various aspects of developing electrical business were reviewed in a panel discussion.

C. B. Barrow of the Gulf States Utilities Company, Beaumont, Texas,

E. C. Carlson, chairman, I.B.E.W. Employers Section, NECA, Youngstown, Ohio; Wm. D. Walker, assistant manager, Penn-Del-Jersey Chapter, NECA, Philadelphia; Claude Skeldon, Skeldon-Green Electric, Inc., Minneapolis, Minn.

David Cockburn, Field Electric Co., Port Chester, N. Y.; Herbert G. Martin, Herbert G. Martin, Inc., Yonkers, N. Y.; Arnold F. Kipp, manager, Westchester-Fairfield Chapter, NECA, Mount Vernon, N. Y.

who is regional chairman of the National Planned Lighting Promotion Committee, led the discussion on what planned lighting means to electrical contractors. He said that every public utility and electrical contractor should have "the man who plans." He defined "the man" as one who should make the lighting layouts and plan the job, and, he continued, the contractor should advise customers that this service is available and sell it.

Barrow reviewed the Edison Electric Institute's all-Industry program, with promotional material directed at five major markets: industrial, store, office, school, and residential lighting. He emphasized that "Planned lighting means profit business" for the electrical contractor.

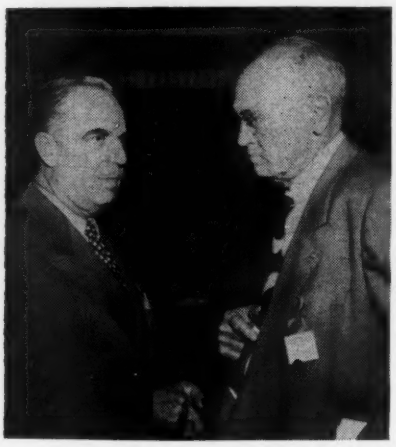
Fred Luna, sales promotion manager of the Anaconda Wire & Cable Company, New York, was panel leader on electrical maintenance. "Sell your customers on the vital need for Preventive Maintenance," he urged . . . "Your sales story can be wrapped up in this seven-word head: 'Preventive Maintenance Is Essential for Continuous Production' . . . Periodic checkups and preventive measures are needed to guard against electrical breakdowns . . . Maintenance business cuts down customer turnover.

"When it comes to economy," Mr. Luna continued, "you can prove that electrical contractors save manufacturers money in handling electrical maintenance. Prepare yourself to get maintenance business, then go and get it."

Donald B. Karlskind, southwestern division manager, United States Rubber Company, spoke on new electrical applications. "There are many new commodities for home, industrial and commercial use," he said, such as television, remote control switching, all types of electric heating." Mr. Karlskind outlined in detail the ceiling type of electric radiant heating.

N. J. MacDonald, vice president, Thomas & Betts Company, Elizabeth, N. J., chairman of the National Adequate Wiring Bureau, talked on adequate wiring. "Selling the public the idea that they haven't begun to live until they start living electrically will expand the size of the markets. Also

John W. Jenner, Shelley Electric Co., Wichita, Kansas; George F. Butler, Beacon Electric Eng'g. & Construction Co., Inc., Buffalo, N. Y.



S. C. Dodson, Dodson Engineering Co., Omaha, Neb.; J. L. McClure, McClure Electric Co., Dallas, Texas.

A. Lincoln Bush, Belmont Electric Co.; New York City; Laurence W. Davis, executive director, N.E.B.F., Washington, D. C.; Clint J. Harder, NECA secretary-treasurer, Wash., D. C.

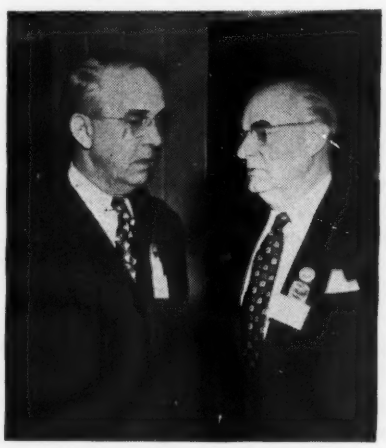
D. A. Fleming, director, NECA Line Constructors Section, Washington, D. C.; Paul Heydon, manager, Northwest Line Constructors, Spokane, Washington.

Ellis M. Fagan, Fagan Electric Co., Little Rock, Ark.; W. G. Hoffman, Tennessee Armature & Electric Co., Knoxville, Tenn.; E. W. McCall, Knoxville.

Howard Pancoast, Bryant Electric Co., Inc., High Point, N. C.; V. H. Douglass, El Paso, Texas; E. R. Bonds, Cleveland Electric Co., Atlanta, Ga.; D. G. Carlton, Ashe Electric Co., Ft. Worth, Texas; Ray Ashley, technical dir., NECA Research Chicago.

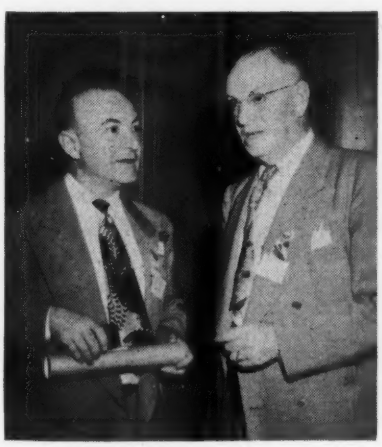
sell the public on the comfort, convenience and economy of living electrically.

"Provide enough outlets in every room in the home to promote convenient and efficient use of all lighting fixtures, appliances, radio, television set and other electrical devices. Our industry is spending between $2 and $3 million a year to promote the adequate Wiring Program. Experts say that 4 million homes will be built in the next five years. Are they going to be conventionally wired homes or are they going to be adequately wired homes? Those 4 million homes represent, if adequately wired, an increase in your market of 16 million branch circuits, 16 million fuses or circuit breakers, 16 million single pole switches, 12 million 3 or 4 way switches, 104 million connection boxes, 36 million duplex convenience outlets, 4 million services, 50 amp. or larger."



K. D. White, White Electrical Construction Co., Atlanta, Ga.; C. J. Kunsman, Fischback & Moore, Inc., Atlanta.

Paul Geary, executive vice-president, NECA, Washington, D. C.; John S. Clark, El Paso, Texas, new chairman, Line Constructors Section of NECA.



F. J. Groleau, NECA Director of Apprenticeship, Washington, D. C.; Ed H. Herzberg, Milwaukee, Wis., Chairman, National Joint Apprenticeship and Training Committee.

H. F. Janick, T. H. Green Electric Co., Inc., Rochester, N. Y.; Earl Driscoll, Driscoll Electric Co., Rochester, N. Y.; George C. Richards, National Electric Products Co., New York City.

J. L. McClure, McClure Electric Company, Dallas, Texas, outlined the NECA Guarantee Program.

Louis Kalischer, Louis Kalischer, Inc., Brooklyn, N. Y., discussed electrical modernization. He described the program carried out in the early thirties in New York in cooperation with utility, manufacturers, wholesalers and electrical contractors. Literature was developed, check lists provided, advertising campaigns in newspapers and direct mail carried out, giving the electrical contractor every facility in aiding him to reach and tell the electrical modernization story to industry.

Educational Program

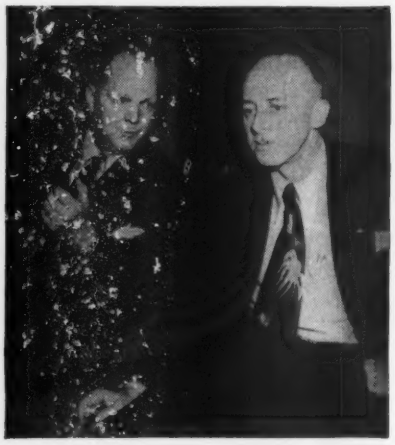
Paul M. Geary, executive vice president of NECA, outlined a concrete program for "Vestibule Training" within the electrical contracting industry to perfect the qualification of electrical contractors and their personnel.

"It is generally recognized in the electrical contracting industry that a program of specialized training in the highly specialized field of electrical application engineering and the conduct of a business of that nature is highly desirable. Technological advances in electrical applications are very rapid. Engineering courses in universities and technical schools equip a

C. R. Wright, Wright Cason Electric Co., Knoxville, Tenn.; L. E. Lawson, Lawson Electric Co., Chattanooga, Tenn.; W. A. Jewell, Chattanooga Neon & Electric Co., Chattanooga.

A. G. Ofenstein, Ofenstein Engineering Co.; Roy C. Spaulding, Spaulding Electric Co.; F. F. Tufts, Gray Electric Co.– all of Detroit, Michigan.

R. W. Smith, Bay City, Michigan; Wm. C. Schlosser, Capital Electric Construction Co., Madison, Wisconsin.



NECA Chapter managers Ben L. Wear, Oklahoma City, Okla.; Frank R. Stewart, San Antonio, Texas.

J. R. Williams, Lord Electric Co., Pittsburgh, Pa.; H. W. Mench, manager, Western Pennsylvania Chapter, NECA, Pittsburgh.

Fred E. Geiss, Fred E. Geiss Electric Co., Kansas City, Mo.; Charles A. Langlais, Charles A. Langlais Co., San Francisco, California.

man for design engineering and give him a basic background in the theory of electricity, but none gives him any practical instruction on how to conduct the business of electrical contracting," he said.

Last year at the convention at Miami Beach, President McChesney proposed that NECA initiate an industry-wide program of training of contractor personnel to improve their qualifications. Since then officers and staff have been studying how such a program could be carried out.

Mr. Geary recommended that NECA sponsor and provide the text books for a program of specialized training for the industry which would include these selective courses of study: Estimating, Job Management, Sales Engineering and Accounting.

Each study unit would be written and edited expressly for the industry. Study units would be suitable for use as textbooks for classroom instruction under qualified instructors, as textbooks for use in instruction by correspondence with local supervision, and as textbooks for use in a nationally conducted correspondence school course offered on an individual basis. Any NECA Chapter could arrange with a local school or university to offer and conduct courses of study for the benefit of students.

It is estimated that at least a year would be required to prepare and publish the texts for the complete program, but that the first course, Estimating, could be ready for use in two or three months.

Research Program

A report of the NECA Research Committee was given by A. C. McWilliams, chairman. He said that a program for the rearrangement of the labor unit tables in the Manual is nearing completion. Several engineering data tables will soon be issued. A table of labor units on "Explosion-proof Equipment" has been added. A table of "Cable Installation" labor units is being compiled.

An all day meeting of the NECA General Research Committee was held covering estimating and research problems. The meeting was opened by Mr. McWilliams, Chairman, and discussion conducted by Ray Ashley. The session was attended by representatives from each chapter and the discussion revolved around the manual of labor units and how to use them. It was the unanimous opinion of the group that

E. B. Defeyter, Power City Electric Co., Spokane, Wash.; Leonard Prince, Lents Electric Co., Portland, Oregon; W. R. Grasle, W. R. Grasle Co., Portland.

G. A. Howarth, manager, Utah Chapter, NECA, Salt Lake City; R. Goold, R. Goold & Son, Stockton, Calif.; E. H. Grogan, manager, San Joaquin County Chapter, NECA, Stockton, California.

this type of round table discussion should be held each year in conjunction with the annual convention of NECA.

Codes and Standards

A report of the NECA Codes & Standards Committee was presented by George Andrae, Milwaukee, Wis. He said, "During the past year they participated in the task of bringing out a 1949 supplement to the 1947 National Electrical Code. It is quite likely that there will be considerably more code revision in the 1950 supplement, and that we may have several annual supplements before a general revision is undertaken or may become necessary.

"Two of our committee members have also served on an American Standards Association Committee to draw up specifications which might be adopted as an American Standard for rigid steel conduit, zinc coated, and also for black enameled conduit. Standards would also be included for nipples, couplings, and elbows. A third specification covers electrical metallic tubing. To date none of these materials has ever been covered by a specification which is recognized as an American Standard."

Line Construction Program

The increased interest in line construction work by electrical contractors was very much in evidence at the convention. At the Tuesday afternoon session, reports of committeemen on research, apprenticeship and training, and chapter organization were received with much interest and resulted in resolutions for the continuance of these activities. C. W. Moseley of Charlotte, N. C., was chairman.

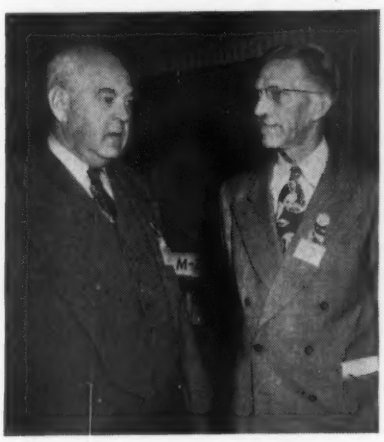
R. J. Stretch of Chicago made a report for the Research Committee.

Apprenticeship and training was covered by Chairman Davis Elliot of Roanoke, Va., who is also a member of the National Joint Apprenticeship and Training Committee representing line construction.

At a meeting of the Executive Committee, John S. Clark of El Paso, Texas, was elected chairman for Line Construction.

R. A. Goeller, Hatzel & Buehler, Inc., New York City; John St. Clair, Kansas City, Mo.

John Link, Link Electric Co.; and S. B. Storm, Marine Electric Co.—both of Louisville, Kentucky.



E. E. Hedler, manager, Penn-Del-Jersey Chapter, NECA, Philadelphia; Howard Banyard, Enterprise Electric Co., Inc., Philadelphia.

Robert J. Etherson, NECA representative, Huntington, N. Y.; H. V. Williams, Bradley Williams, Inc., Syracuse, N. Y.

Other Highlights

At the luncheon meeting on Wednesday, Dr. John R. Steelman, assistant to the President of the United States, was the principal speaker. Dr. Steelman said that he had every confidence

(*Continued on page* 84)

BUSINESS would have a terrific time functioning without adequate accounting and accounting controls, but all of our effort channeled in that direction is in terms of "hindsight" and not "foresight." In addition to knowing where we stand on the basis of past performance, it is equally important to know where we are going and to have some control over the amount of business we are getting from day to day.

It is obviously impossible to plan work from day to day in such a way that it falls accurately and decisively into a daily work pattern. But, the *all important* point is to make certain that enough work is being secured from week to week to maintain a continuing volume of business which is adequate to cover operating expenses and provide a profit for effort expended.

The entire profit and expense control of any business operation depends upon "budgeting". The operation of "work progress control," or feeling the pulse of your business in advance of your accounting reports, depends upon the proper control of man-hours of work since the work estimated and secured is balanced against the man-hours of work required to meet the budget.

All types of business dealing in the two commodities of labor and material have the same problem: *Making certain that all overhead costs are adequately covered in preparing estimates; and that enough man-hours of work are secured to meet the budgeted volume of work previously established.* The two problems go hand in hand and both must be solved in order to solve either one.

To approach the solution of these problems, it must first be recognized that all estimates must be carefully and meticulously prepared. All estimates must be broken down into man-hours; also additions to contracts, and all other types of work pertaining to the total budget of the specific contractor.

In preparing the budget, previous experience or business statistics secured from industry surveys must be used as the basis of all calculations. No matter how good these figures may be, it would be impossible to develop a perfect program. Sound business judgment should be used in establishing the total volume of sales.

Factors Affecting Volume

Total sales volume which a specific contractor can handle is a function of the following factors:

MAN-HOUR CONTROL - - - - WEEKLY REPORT

Date 9-31-49

YEARLY MAN-HOUR QUOTA		30,000
INCOMPLETE WORK TO DATE	5,000	
COMPLETED WORK - YEAR TO DATE	20,000	
TOTAL MAN-HOURS SECURED - YEAR TO DATE		25,000
MAN-HOURS TO BE OBTAINED		5,000
NUMBER OF WEEKS REMAINING IN YEAR		10
AVERAGE MAN-HOURS REQUIRED / WEEK		500

WEEK OF	MAN-HOURS SECURED	BOGIE	OVER OR UNDER
10-7	0	500	-500
10-14	400	500	-100
10-21	100	500	-400
10-28	1,200	500	+700
	TOTAL MAN-HOURS TO DATE OVER BOGIE		
	TOTAL MAN-HOURS TO DATE UNDER BOGIE		-300

***FIG. 1**—Man-hour control report is completed weekly; gives a clear picture of total volume secured to date in terms of man-hours; shows what has yet to be secured to attain established yearly volume bogie.*

A NEW LOOK INTO

1. Experienced personnel
2. Building and equipment facilities
3. Capital
4. Total amount of business available (potential)
5. Management

In fact, one of the most pressing problems of an electrical contracting business is that the minimum organization required to do a real job is quite large. Therefore, quite a substantial volume of business is required.

Minimum personnel necessary to efficiently operate an all-round electrical contracting firm could be outlined as follows:

A. Manager
B. Estimator and superintendent
C. Bookkeeper
   1. Clerk—typist—telephone operator—pricing clerk
D. Storekeeper
   1. Truck driver

Such a staff could probably handle efficiently a $250,000 annual business volume, and it would require a well coordinated unit at that. The staff for any business is determined entirely by the type of operation pursued. In general, the following types of operations might be involved:

1. Straight electrical construction secured primarily by bid on plans issued by architects.
2. Combination of Bid Work and Jobbing Work. Most of the jobbing work is sold through business contacts on a Time and Material basis.
3. Combination of Bid Work, Jobbing Work and Service Work performed by a fleet of trucks.
4. Combination of B-W, J-W, S-W with a Motor Shop and a power equipment sales setup.
5. Combination of all the above with an organized Lighting Sales Department.

Each of these categories would require an entirely separate budgetary treatment. In the final analysis, however, it would be found that *a certain number of man-hours of work under normal conditions would be required to sustain the total operation.*

The simplest way to arrive at the *total number of man-hours* for a given volume of business is as follows:

$$\text{TOTAL MAN-HOURS} = \frac{\text{Total Sales (dollars)} \times \text{Normal Percent Labor (30\%)}}{\text{Average Labor Rate per Hour}}$$

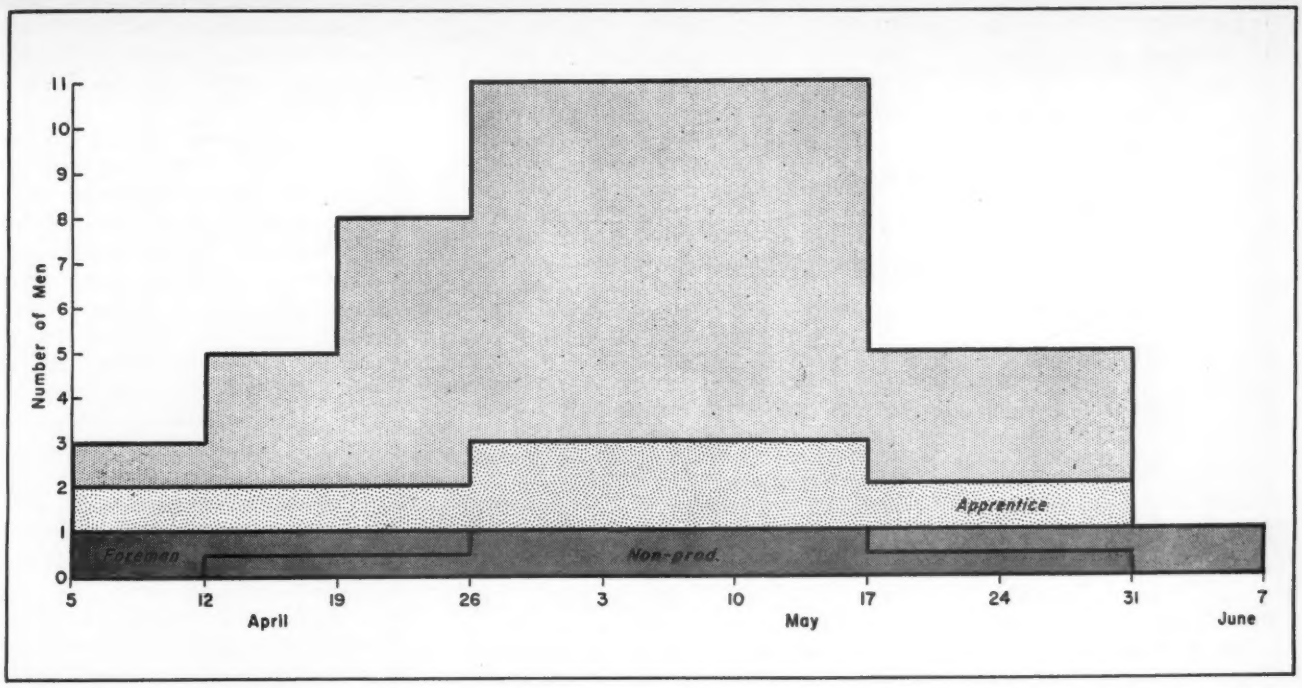


FIG. 2—*Man-power schedule for each job is kept and incorpporated in a master schedule to forecast man-power that will be rquired at any particular time.*

YOUR BUSINESS PROGRESS

A new approach to the problem of budgeting and controlling an average all-round electrical contracting business operation, using "man-hours" as the yardstick.

By Ralph E. Johnson
Vice-president and General Manager
Sturgeon Electric Company, Inc.
Denver, Colorado

In the case previously mentioned Annual Volume is $250,000. With normal labor running at 30 percent of sales and an average hourly rate of $2.50; then:

$$\text{TOTAL MAN-HOURS} = \frac{\$250{,}000 \times 0.30}{\$2.50} = 30{,}000$$

The total of 30,000 man-hours for the year would represent a force of nearly 15 men *working full time.*

Assuming that the *budgeted overhead* is 20 percent (which is low) of sales, there would be a yearly overhead cost of 50,000 dollars. Then:

$$\text{OVERHEAD BURDEN} = \frac{\text{Overhead Cost}}{\text{Man-hours Worked}} = \frac{\$50{,}000}{30{,}000} =$$

$1.66 per man-hour worked.

This means that the Total Overhead Cost of doing business would be completely covered in the contractor's estimates if the man-hours are estimated

MONTHLY PROGRESS REPORT - CONSTRUCTION JOBS
MONTH OF AUGUST 1949
ENGINEER - FRED JONES

W. O. Number	Job Name	Total Contracts & Extras	Total Cost To Date	Estimated Man-Hours	Man-Hours To Date	Percent Man-Hours To Date	Percent Job Complete To Date	* Ratio
4271	AKRON HOSPITAL	10,000	7,000	1,240	1,200	97	95	-2%
1279	FORD WHSE	49,000	12,500	6,090	1,271	21	25	+4%
5500	ACE GARAGE	2,470	1,117	306	341	111	90	-21%
		61,470	20,617	7,636	2,812			
				2,812				
				4,824				
	INCOMPLETE MAN HOURS =			4,824	←			

FIG. 3—*Monthly progress report on construction jobs shows progress made on each job; is a means of determining incomplete man-hours to date.*

WEEKLY MAN-HOUR REPORT — WEEK ENDING 9-31-49

MAN-HOUR QUOTA (Total for Fiscal Year)		30,000
MAN-HOUR QUOTA PER WEEK	600	
NUMBER OF WEEKS - FISCAL YEAR TO DATE	40	
MAN-HOUR QUOTA - YEAR TO DATE		24,000
MAN-HOURS FOR THE WEEK:		
STRAIGHT TIME	700	
OVERTIME	—	
TOTAL	700	
TOTAL PREVIOUSLY REPORTED	22,500	
MAN-HOURS - YEAR TO DATE *** TOTAL		23,200
MAN-HOURS - YEAR TO DATE — SHORT OF QUOTA		800
MAN-HOURS - YEAR TO DATE — OVER QUOTA		

SIGNED F. L. James

APPROVED

FIG. 4—*Weekly man-hour report is completed and given to the Superintendent each pay day; keeps him constantly posted as to progress made toward attaining established annual man-hour quota.*

SIMPLE BID SUMMARY FORM

TOTAL MATERIAL COST			$
TOTAL LABOR COST	____hrs. @ ____rate	$	
OVERHEAD BURDEN	____hrs. @ ____cost	$	$
TOTAL JOB EXPENSE:			
Permits		$	
Payroll Tax ___% of Labor		$	
Misc.		$	$
		TOTAL GROSS COST	$
____% RETURN			$
____% SALES TAX ON MATERIAL			$
____% EXCISE TAX			$
		TOTAL ESTIMATE	$

FIG. 5—*Simple bid summary form that can be used when Labor Burden is applied as Overhead on electrical construction jobs.*

for each job and an amount added for overhead cost equal to the total man-hours times the $1.66 per hour burden.

THE IMPORTANT POINT IS THAT THESE FACTORS MUST BE DETERMINED BY THE CONDITIONS WHICH ACTUALLY EXIST IN THE BUSINESS OPERATION IN QUESTION.

From the previous hypothetical case we have established the following important factors:

Total Man-Hours Budgeted for the Year	30,000
Total Overhead Burden in Cost Per Hour	$1.66
Total Annual Sales (100 percent)	$250,000
Total Overhead Cost (20 percent of Sales)	$50,000
Total Labor Cost (30 percent of Sales)	$75,000

Under this system, the *entire overhead cost of doing business is borne in the estimate by labor.* Not a cent is added to material. The entire overhead allowance is a function of cost per man-hour, and not a percentage of total job cost as so often is the case. (A complete discussion of this philosophy of Overhead appears in "Check and Double Check", pg. 54-57 Nov. 1948, EC&M).

This procedure is entirely regular when one considers that it is very impractical, and almost impossible, for a proper evaluation to be placed on an item of material. No more shelf space is taken by a very costly, special relay than is taken by an ordinary sheet metal junction box. Yet, there is no comparison as to the dollar value of the two items. Also, jobs vary so widely with respect to the amount of material a contractor must furnish under specific conditions, that it becomes an unreliable factor upon which definite procedures cannot be established.

With these points in mind, it appears that—*Man-hours of labor offer the most stable basis upon which to establish controls in the electrical contracting business.* The accompanying Simple Bid Summary form shows how Overhead Burden on Labor fits into a job estimate.

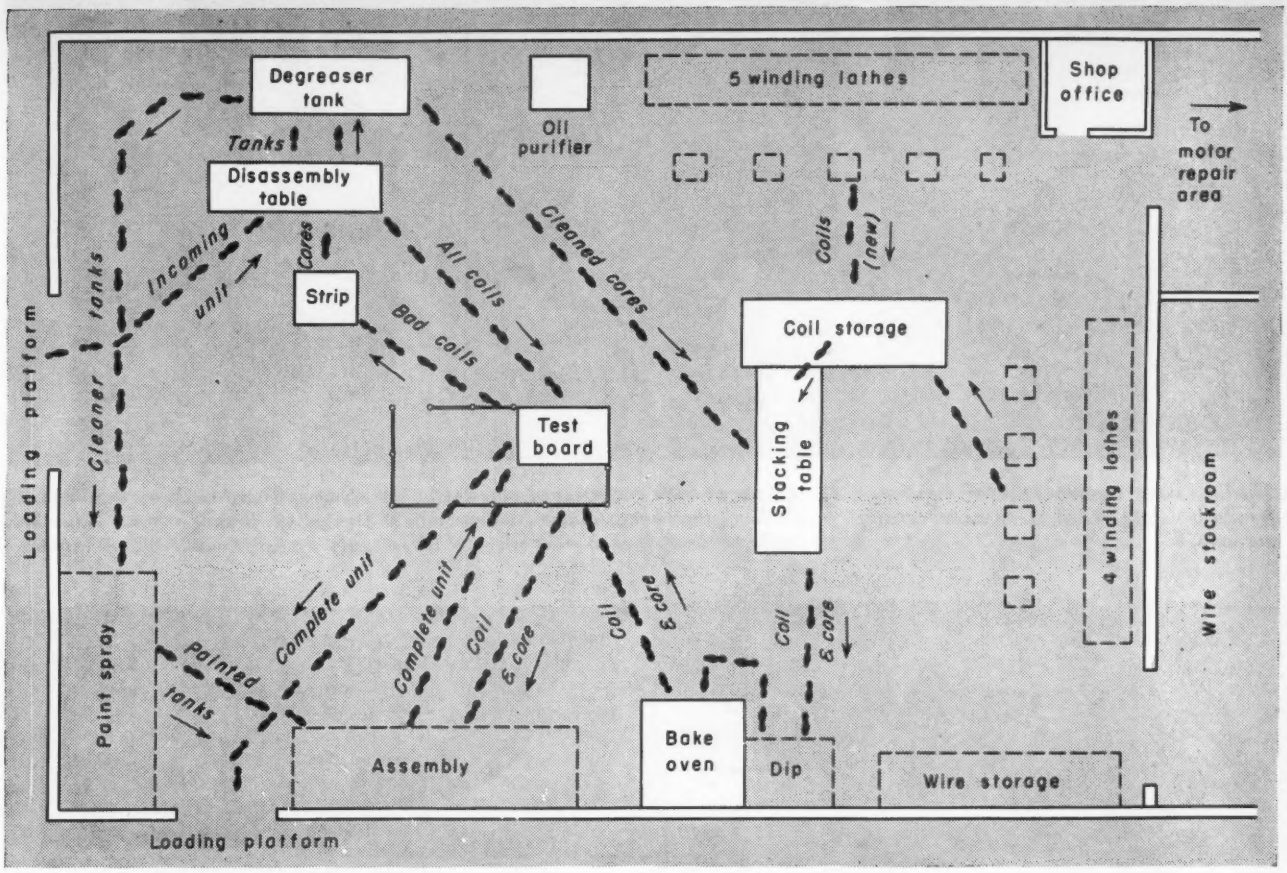
With estimating and accounting control thus established, it is now equally important to develop some means to assure that the 30,000 man-hours (needed to cover the complete overhead cost of doing business) will be secured.

Control Forms Used

For purposes of simplification, it must be assumed that *all* of the business to be secured must be estimated in advance. Using the previous example, 15 men working 40 hours per week will total 600 man-hours per week. But, there are always a certain number of incomplete man-hours which were previously secured. These man-hours already on hand help to reduce the average number which must be secured each week in order to maintain the required budget.

A very simple method of keeping this picture constantly at hand is to use a "MAN-HOUR CONTROL—WEEKLY REPORT" sheet illustrated in Fig. 1. Not all jobs materialize exactly as planned. For instance, the man-hours which appear on this control sheet for a certain week might not be used until nine months later because of the nature of the work, or because of some unavoidable delay. Consequently, it is also necessary to prepare for each job a "MAN-POWER SCHEDULE" which can be incorporated into a master schedule for the purpose of forecasting the man-power which will be required for any

(*Continued on page* 84)



PLAN VIEW OF SHOP *area used for transformer repairs showing equipment location and work routing.*

Specializing in Transformer Repairs

Efficient shop layout, modern equipment, emphasis on workmanship and testing and a volume market make the transformer repair division of Dowzer Electric Machinery Works, Inc., Mt. Vernon, Ill., a successful operation.

By August Eckel

TEN years ago, Dowzer Electric Construction Company organized a small electrical equipment repair division to accommodate its customers in the area surrounding Mt. Vernon, Illinois. Today, the repair shop—known as Dowzer Electric Machinery Works, Inc.—has completely superseded the construction division and has a transformer repair department that accounts for better than two-thirds of the annual business volume.

Dowzer's president, Charles J. Covington, is a former electrical construction engineer. During years spent on large construction projects, he learned the value of modern tools and techniques as an efficiency booster and a "life saver" in a competitive market. He successfully injected this philosophy into his repair shop operation and now has a transformer business that covers eight surrounding states; a production set-up that can turn out 150 average units (3 to 15 kva.) per week and give 24-hour emergency service if necessary, equipment that can handle the smallest or largest transformer.

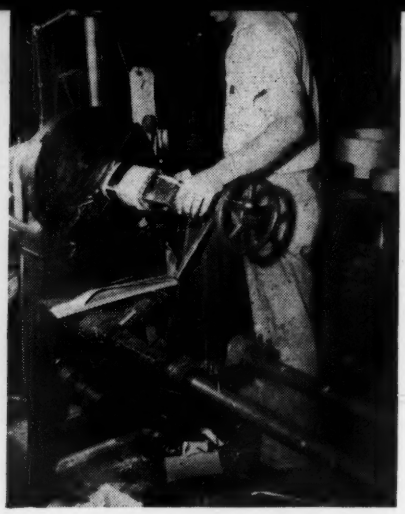
Volume is one key to success in the transformer repair field. Dowzer's customers include some 120 rural electric co-operatives, 13 public utilities, 55 municipal electric plants and several industrials. Normal production schedules range from three to four weeks, including pick-up and delivery at the customer's premises. To avoid delay, Dowzer uses its own trucks operating on a carefully planned route schedule.

Covington's philosophy also emphasizes technical skill. So he has Rex V. Woodward, a graduate experienced electrical engineer, supervise the entire shop operation; also a second graduate electrical engineer responsible for testing of *all* transformers that go through the repair department. A crew of 27 to 30 mechanics, trained in the Dowzer shop, handle the normal production chores of stripping, cleaning, winding, stacking, baking and assembly of the units. Three drivers, a trucking supervisor and a full time sales engineer complete the shop roster.

Modern equipment and an efficient

1—*Degreaser contains heated solution. Cleaned tanks then go to paint spraying area.*

2—*Damaged coils are stripped on raised platform that keeps oil and windings off the floor. Core is then cleaned.*



3—*New coils are made on winding lathe. De-reeling frame behind lathe holds magnet wire reel and roll of insulation.*

6—*Walk-in bake oven is conveniently located behind stacking table; receives assembled coils and cores after varnish dip. Automatic oven controls regulate baking cycle.*

7—*Units are reassembled; all connections completed; oil, bushings and cover added. Assembly area is near test board and paint spray department.*

shop layout permit maintenance of the rigid production and service schedule. Stripping and cleaning time is reduced by use of air chisels and a chemical degreaser; testing is now a matter of turning knobs and reading meters. Electric hoists do all the heavy work. Even a hydraulic tail-gate on two of the trucks lifts transformers from the ground to truck bed. Equipment is so located that back-tracking and wasted steps are reduced to an absolute minimum. Straight-line production flow is employed to the fullest extent, with a unit practically circling the shop area from the time it arrives until it is shipped.

Accurate and adequate testing is a "must" item in the Dowzer standards. All transformers are thoroughly tested before dis-assembly. Damaged coils go back for stripping; those not requiring rewinding go to the bake oven for bake-out and minor repairs. New coils are tested after leaving the bake oven and the entire transformer unit receives a final test after assembly. Strict adherence to the NISA Transformer Rebuilding Standards (adopted April 19, 1948) is required. To facilitate testing, Dowzer installed a new totally-enclosed, dead-front test board that provides a voltage range from zero to 2,400, with additional transformers for high-voltage testing up to 150,000 volts. Two frequencies, 60- and 480 cycles are available. Because of their increased accuracy, portable meters are used on the board instead of conventional flush panel meters.

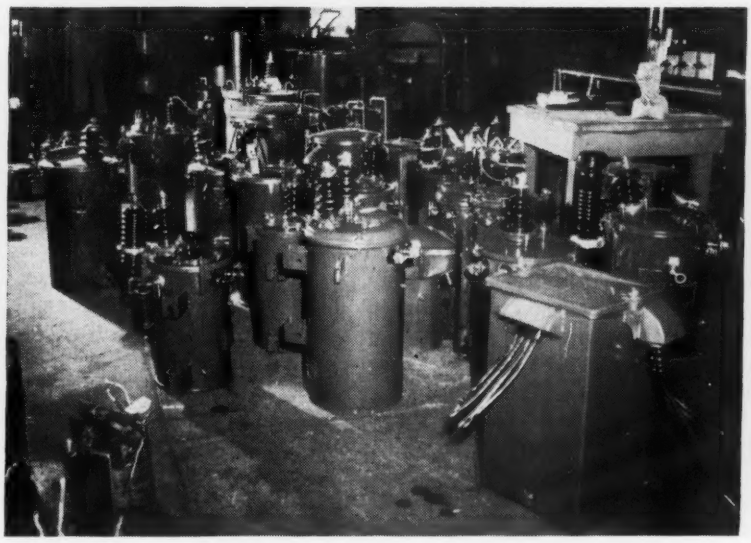
A definite repair procedure is followed with the work routing adjusted to produce the highest possible shop operating efficiency. Included are the following steps, many of which are illustrated in the photographs:

1. Incoming transformer *test.*
2. Stripping of damaged coils and cleaning of all tanks and metal parts. Other coils go to oven for bake-out.
3. Painting of tanks and covers.
4. Winding of new coils.
5. Stacking of core laminations and addition of coils.
6. Dipping and baking of assembled coil and core.
7. New coil and core *test.*
8. Re-assembly of repaired transformer.
9. Final *test* of completed unit.
10. Shipment to customer on Dowzer trucks.

While this procedure is efficient, Dowzer engineers are experimenting with new techniques in order to improve efficiency and reduce operating costs.

4—*Coil storage table holds newly wound coils awaiting installation on cores. Table is directly behind group of winding lathes; also holds numerous wood forms for the lathes.*

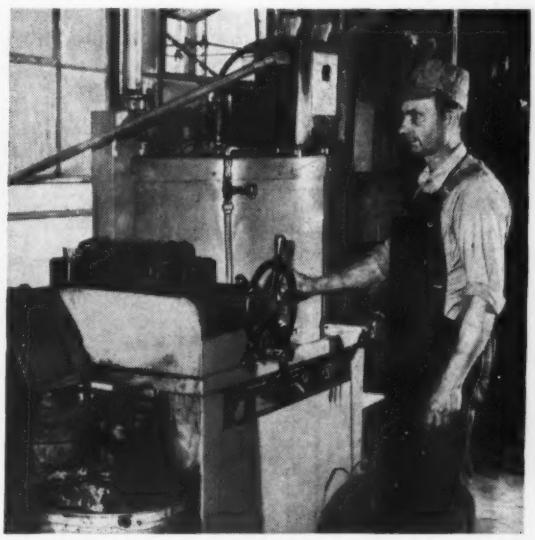
5—*Stacking table is adjacent to coil storage table; provides ample working space for stacking core laminations and mounting new coils.*



8—*Repaired transformers behind test board await final test before being loaded on truck for shipment. Units are tested when they enter shop, after coils are baked, and before delivery.*

9—*Final test is last of three. Totally-enclosed, dead-front board is located in center of repair area to save steps.*

10—*Loaded on truck and ready for delivery. Double deck provides added pay load for both pick-up and delivery. Hoist boom is adjustable to three positions on truck body.*



11—*Oil purifier removes acids, impurities and moisture from used transformer oil; reclaims about 80 percent of original stock.*

SIGNALS for WET LOCATIONS

Considerations for planning and installing signalling and communication systems in damp or wet locations.

By
A. A. Schuhler

THE market for signaling and communication equipment for installation in damp or wet locations offers an opportunity for development far beyond the imagination of the average person. In these days of high installation costs and equally high maintenance costs together with the requirements of efficient service, due consideration should be given when planning such installations.

In a general classification, the National Board of Fire Underwriters describes dry, damp and wet locations. A dry location is one not normally subject to dampness or wetness, however, it may be temporarily subject to such conditions as in the case of a building being altered or under construction. A damp location is one subject to a moderate degree of moisture, such as some basements, some barns, some cold storage warehouses, or some building connecting tunnels. A wet location is one subject to saturation with water or other liquids, such as those exposed to the weather, wash rooms in garages, walls in sections of dairies, slaughter houses, launderies, canneries, breweries, wood pulp plants and in fact any installation underground, or in concrete slabs or masonry in direct contact with the earth.

As to the types of equipment recommended in locations specified in the preceding paragraph they are classified as raintight, vaportight, waterproof and watertight. A raintight device is one so constructed that exposure to a beating rain will not result in the entrance of water. A vaportight device is one so constructed that vapor will not enter the enclosure. A waterproof device is one so constructed or protected that exposure to the weather will not interfere with its successful operation. A watertight device is one constructed so that moisture will not enter the enclosing case.

Approved Equipment

Of the above equipment classifications there are only two which definitely carry the Underwriters approval and labels signifying the use of cabinets, housings or fixtures and these are raintight and vaportight. Other signal equipment for ordinary and outdoor applications while submitted and approved by the Underwriters do not carry their label service.

A large number of signal and communication devices are available to meet practically any condition. These include bells, clocks, fire alarm stations, horns, pushbuttons, switches, sirens, pilot lights, telephones, watchman stations, annunciators, control units etc. In addition enclosures and cabinets are available for fuses, relays, terminal strips etc.

Conduit systems in wet locations, including all boxes and fittings used therein, must be made watertight. This may be done by applying white lead or waterproof compound to the threads and joints. In very moist locations low points in conduit runs must be avoided and wherever possible some arrangement provided for draining the conduit of water which may collect. These precautions should be taken because it has been found practically impossible to prevent water vapor from entering a conduit system. Only the best grade conduit galvanized inside and out should be used to prevent corrosion.

After completing each conduit run, plug up the ends to prevent moisture from entering.

Before pulling in wires, a snake should be run through the conduit with a swab attached, using a forward and backward movement until all moisture is removed. When water is found in the conduit the reason for same should be investigated and the source of the difficulty corrected.

In most cases the presence of water is accounted for by condensation of moisture caused by air circulating in the conduit. Occasionally a conduit system which is ordinarily considered dry is found to accumulate moisture at certain points. It is therefore advantageous to pitch or slope each run so that water cannot be retained therein.

Where conduits are exposed to widely different temperatures such as in cold storage or refrigerator plants, the conduit should be sealed in the space of the moderate temperature just before it passes through a cold room or section. If the air is permitted to circulate from the warmer to the colder section of the conduit system, moisture in the warm air will be condensed and accumulate in the cold section.

Signal system conductors used in wet locations should be rubber-covered or lead-covered. The former must be of the moisture resistant type RW the insulation of which is moisture resistant rubber and an outer covering which is moisture resistant, flame-retardant and fibrous. The latter is similar in construction except that it is enclosed in a lead sheath and does not require a

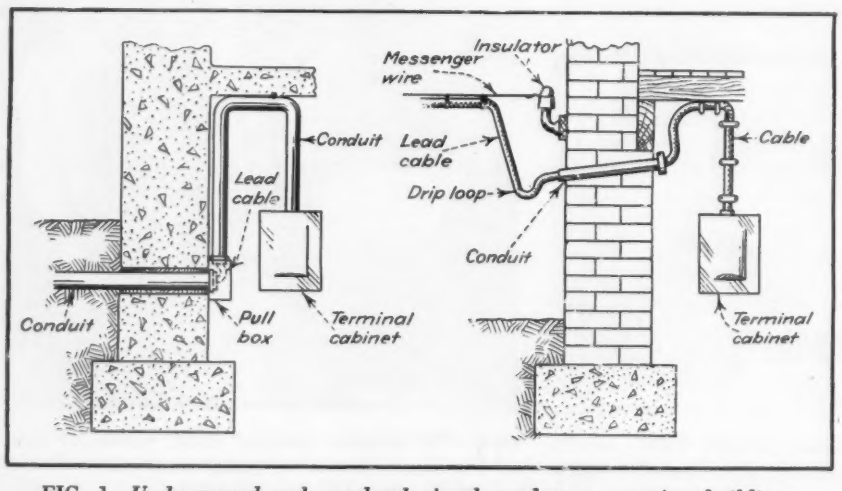


FIG. 1. *Underground and overhead signal conductors entering buildings.*

flame-retardant, moisture resistant outer covering over the individual conductors, but all such conductors have a fibrous covering. This type is known as RL.

Lead-covered conductors are preferable to the type RW in underground conduits. This is particularly true where they pass near fuel tanks or fuel pipes. Leaky fuel and gasoline systems often find their way into electric conduits and cause rapid deterioration of rubber insulation on the conductors if they are not protected with a lead sheath.

Cable Selection

Lead-covered telephone cable must be used wherever moisture is prevalent. Braided telephone cable is satisfactory for use in dry places. It must never be used outside of a building, in underground conduit or where there may be moisture.

Signal and communication wires installed underground must not be placed in the same duct, handhole or manhole containing electric light or power wires, except in a section separated from such conductors by means of a brick, concrete or tile partition.

Where underground conductors enter a building, they must have mechanical protection such as rigid conduit. An example of such an installation is shown in Fig. 1.

Open conductors entering or leaving locations subject to dampness or wetness must have drip loops formed on them. They must then pass upward and inward from the outside of the building, or from the damp or wet location, through non-combustible, non-absorptive tubes or conduit. An example of such an installation is also shown in Fig. 1.

Open conductors exposed to the weather must have a separation of not less than three inches if supports are placed at intervals not exceeding four and one half feet, and the conductors are not less than two inches from the surface wired over.

Open conductors located adjacent to water pipes or tanks, or in other damp locations must be installed so that an air space will be permanently maintained between them and the pipes which they cross. Where practicable, the conductors must be run over, rather than under, pipes upon which moisture is likely to gather or which may leak.

Entirely too frequently may front door pushbuttons be seen in expensive homes, institutions and industrials which are subject to all types of weather conditions, and yet are of inferior construction. The ideal pushbutton for such locations would be of watertight construction. Such a unit would be thoroughly enclosed, have a threaded hub or backplate for conduit, and a rawhide disc covering the pushbutton and the contacting springs. Unless a pushbutton is properly enclosed failures in operation will be caused by the oxidation of the contact springs and loose connections due to expansion and contraction of the insulating material on which the contact springs and terminals are mounted. Other types are available with cast housings and with multiple pushbuttons provided with flanges for mounting on walls and gates.

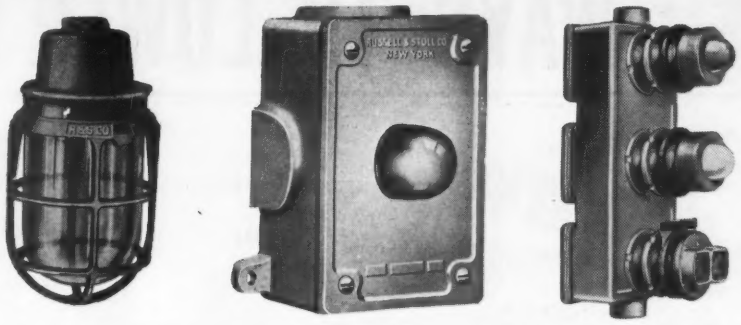


FIG. 2 *Vaportight lamp signal station (left).* FIG. 3. *Pilot light signal station (center).* FIG. 4. *Multiple pilot light and switch unit for panelboard mounting (right).*

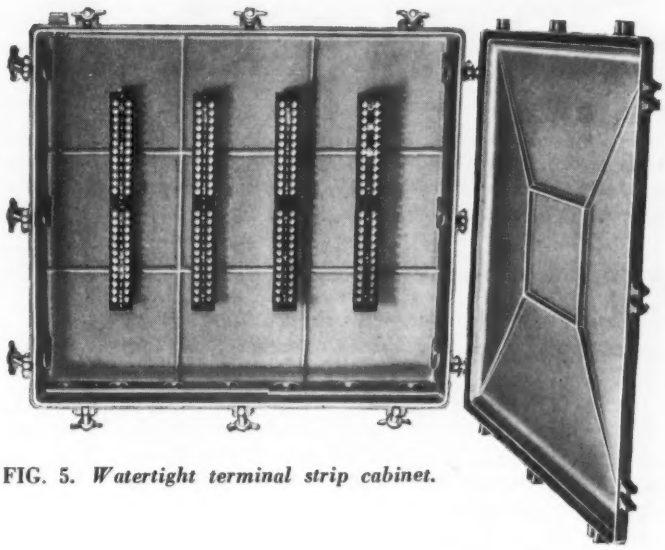


FIG. 5. *Watertight terminal strip cabinet.*

Lamp signals may be provided in vaportight fixtures as shown in Fig. 2. These may be used on coded paging systems, on machinery or process signals adjacent or near equipment or tanks, loading platforms and many other locations. They are particularly suitable where steam and other vapors are prevalent. The glass globe is threaded into the base. It may be obtained with or without a protective guard. The metal parts are made of cast aluminum, brass or iron as desired.

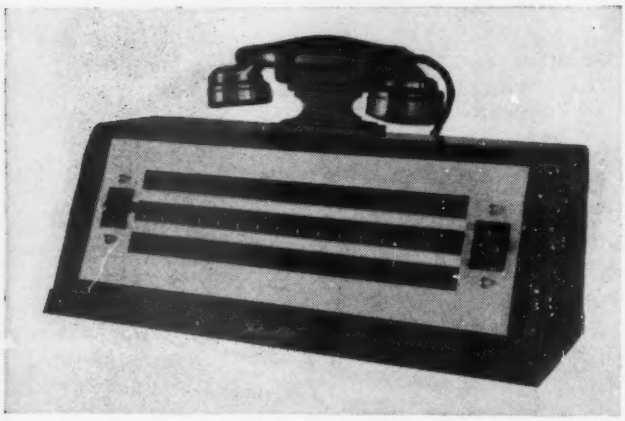
Bells may be secured in the weatherproof and watertight types. They may be of the vibrating type for signaling, single-stroke type for paging and fire alarm and of the polarized type for telephone service. When mounted on the exterior of a building or in a wet location they should be of watertight construction. Weatherproof bells have been found satisfactory for exterior installations where properly gasketed and provided with a protective housing and screen made of galvanized metal or of copper or aluminum. Outlet boxes for outdoor installations should be of cast brass or iron.

Horns of the motor-driven and vibrating types are obtainable in weatherproof construction. There are enclosed in cast iron housings which are provided with threaded conduit openings. The projectors may be stationary or adjustable, pointed and locked in any direction.

Pilot light signals are made in watertight cases to meet any condition. A single unit is shown in Fig. 3. These may be used in damp or wet locations, adjacent to machinery or

(*Continued on page* 84)

WAYS TO LOWER COSTS III . . .



Interplant communication systems speed maintenance and repair work, for tools and equipment can be requisitioned, emergencies can be reported and materials ordered quickly and directly without the necessity of personal trips.

28. Communication Networks

The installation of a telephone network or similar intercommunication system between crib stockrooms and the central stock area, or between crib crew headquarters and the office of the supervising engineer, is also desired. For by this arrangement special tools and extra material can be requisitioned with minimum delay and orders or problems can be transmitted without the necessity of a long walk between the mentioned areas.

29. Check Lists

While many maintenance men doubtlessly can memorize comprehensive and complex routines, check lists should be conveniently posted for rapid reference to minimize the possibilty of omissions. Check lists can take several forms. One such form might suggest procedures to follow for each type of equipment. For example; the following partial list might appear on a procedure sheet prepared for the routine checking of transformers.

TRANSFORMERS

VOLTAGE (both primary and secondary)

LOAD AMPERES (on secondary side—with recording ammeter)

INSULATION (take resistance readings with megger)

OIL CONDITION (cleanliness and dielectric strength)

OIL LEVEL and **TEMPERATURE**

CONNECTIONS (they may have deteriorated because of heat, vibration, mechanical or electrical stresses)

GROUNDING (may have deteriorated because of vibration or corrosion)

And so on . . . .

Check list of transformers might follow the general scope of this partial reminder. When conveniently located, such lists relieve maintenance men of extensive memory chores and guarantee the thoroughness of scheduled servicing routines.

Perpetual inventories provide up-to-date information on purchases, withdrawals, balances, suppliers, delivery dates and related information. A Wheeldex Card File can be quickly rotated to the item being considered.

30. Perpetual Inventories

Size of inventories is determined by past experience within a particular plant. It involves a knowledge of shutdowns over a given period, the amount of work required at these times and the number of units in operation. Minimum stocks can be determined by first ear-marking material required for a single emergency. Then sufficient stock should be carried to maintain normal operations for the length of the normal delivery period. This supply is augmented by stripping useful parts from equipment ready to be scrapped.

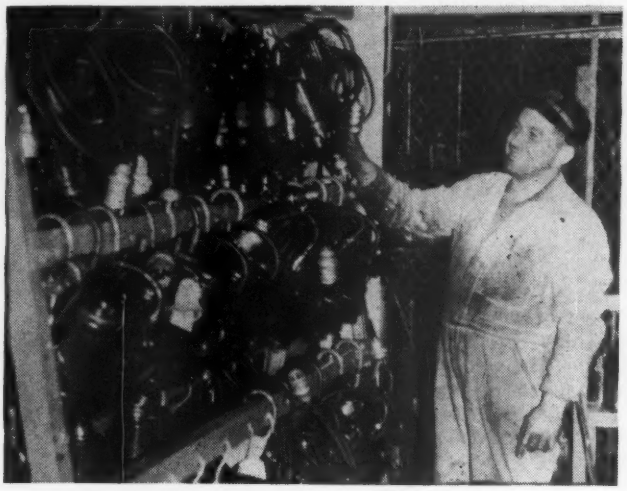
To have an up-to-the-minute picture of the stock situation and the supply market, the stock clerk should have a perpetual inventory on which he can record all purchases, withdrawals, balances, suppliers, delivery dates, prices and discounts. Also, in case outside help is required, he should have on call a good motor repair shop and an electrical contracting firm. One of many useful perpetual inventory systems utilizes a rotating card file, tabbed in color to indicate at a glance what items are low, on order, or in the process of delivery.

31. Portable Kits

Portable trouble kits are also useful; varying from small, strap-supported kits which may be slung over the shoulder to combination work benches and spare-parts cabinets which may be rolled anywhere in the plant as necessity dictates. Also to be included where applicable are rolling scaffolds and ladders.

32. Purchasing

Purchasing material at frequent intervals has several economical advantages. One advantage is safety, for if orders are delayed until sizable quantities are required, the possibility of being "caught short" offsets the advantage of buying quantities at a slightly lower bulk price level. Also, if huge quantities are ordered, valuable storage space is required. Suppliers' stocks are also periodically depleted, creating a supply problem for other plants in the neighborhood.



Stockrooms should contain a comprehensive assortment of tools, selected for the type of work contemplated and kept in constant repair. Tools should be used only by authorized persons in accordance with their designed purpose.

33. Crib Crews and Stockrooms

In large plants maintenance frequently can be more effective when crews are spotted strategically to take care of maintenance within specific areas or associated with specific types of equipment. These crib crews are equipped with their own tools, instruments and spare parts crib, with sufficient material to handle normal repairs. While decentralized stockrooms are not practical in small plants, they have been extensively used to advantage in larger manufacturing plants covering considerable area. Each crew has its own leader.

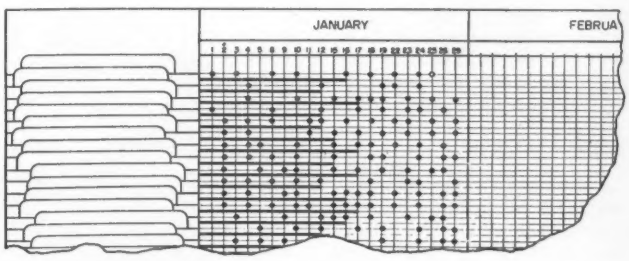
Special tools, although their application is restricted, are justified if they eliminate the necessity of scaffolds or ladders, or minimize the time and energy required to accomplish a job.

34. Tools

A complete stock of tools is likewise essential for efficiency, with tools including mechanics hand tools for routine maintenance, heavier shop tools and special purpose tools.

Included in the mechanic's personal kit are such general-purpose tools as pliers, screw drivers, wrenches, tape, hacksaws, a pocket knife, flashlight, chisels and so on. Shop tools would include heavier equipment furnished by the plant, such as pipe threaders, vises, hoists, scaffolds, power tools and similar equipment. Special purpose tools are self-explanatory, including such items as high-bay telescopic working platforms or linesman equipment.

Here again, Check Lists are useful, for they act as a guide for purchasing new equipment, replacing old tool kits and investigating new products on the market. Found on many lists are such serviceable items as hydraulic thin-wall conduit benders, angle power drills, portable air compressors, power driven knockout cutters, solderless crimping tools, electric drills, fuse pullers, insulation sleeves, electric cable pullers, carborundum cutting saws and industrial trucks. Savings in time, effort and materials will quickly justify the relatively modest investment in these items. Naturally, the number of tools and their variety will depend upon the size of the plant and the complexity of the maintenance program.



Control board is definite aid in visually reminding maintenance personnel of scheduled inspections, adjustments, cleaning and oiling. Bars are moved to right as assignments are completed, indicating status of work at all times.

35. Control Board

Effective maintenance is sound economy. For equipment is of little value when inoperative of functioning inefficiently. Breakdowns and attendant losses of machine-hours, man-hours and production units must be eliminated. And this demands maintenance; *preventive* maintenance.

First in importance is a plan for checking all electrical equipment. To insure that these checks are made it is necessary to establish a schedule, dependent upon the importance of equipment, its use, type and location.

In this connection a control board is helpful, combining a file of cards (containing equipment characteristics, past performance, repair records, and location in the plant), a fixed pattern of pegs to indicate the pre-planned dates for inspections, and a series of movable pegs to indicate the status of assignments; pegs being moved to the right as assignments are completed. Since inspection regularity is essential, this type of visual reminder is excellent insurance against overlooking details.

To insure thoroughness, equipment should not only be listed but detailed procedures should be established and followed. In addition to visual checking, these procedures should include cleaning, testing, replacement of worn parts, overhauling parts removed, and keeping adequate supplies of parts on hand.

G-E REMOTE CONTROL WIRING SYSTEM MAKES IMPORTANT CONSTRUCTION NEWS

Step-saving system of switches modernizes industry, farm, home

Compact Relays Simplify Wiring

Key to the General Electric remote control wiring system is the small relay that fits into a knockout in a standard outlet box. A twenty-five-volt circuit is used to energize the relay from a step-down transformer.

With the relay in place, leads can be run from it to many convenient switch locations. Small, neat-looking remote control switches can be placed practically anywhere, and can be easily connected to these leads.

Principal components of the General Electric remote control system are the transformer, lightweight Number 18 wire, remote control switches, and the relay. These units are all designed to fit in with standard wiring practices. In fact, the remote control system requires no change in power circuits.

Contractor, Architect Have Unlimited Scope

Working as a team, the electrical contractor and the architect can devise unlimited applications of the General Electric remote control wiring system.

Limited budgets as well as high-priced jobs, can well afford this practical, new system. Even for low-cost dwellings, the architect and contractor can use a few remote-control circuits which add another selling feature.

It will pay you to talk to your General Electric Construction Materials distributor about this new system right away.

Cuts Wasted Time in Plants, Farms

Industrial plants, commercial buildings, hospitals, and farms can do a man-sized job of cutting wasted time with the General Electric remote control wiring system.

The farmer can use this system to control lights and light-duty motors in outbuildings, right from the farmhouse or the barn. In industrial plants and commercial buildings, entire floors of lights can be controlled both from switches near the light fixtures and at convenient master control points.

Valuable working time can be saved by conveniently-located switches in the General Electric remote control wiring system.

In hospitals, General Electric remote control switches can be placed at each bed and at room entrances. Master control can be located in an office or hallway.

Because of the simplicity of this system (see story, Column 1)—because remote control switches and wire are small and trim the General Electric remote control wiring system makes neat surface-wiring installations in existing buildings. Surface installations of this kind can easily be relocated as the requirements change.

A single General Electric remote control switch, or a bank of remote control switches, can be located anywhere to give convenient control of appliances and lights.

Offers Home Owners New Benefits

Dream-home lighting control—a practical, economical system that permits any number of switches to be placed practically anywhere in a home, for the ultimate in convenience! That's the promise of the General Electric remote control wiring system.

Now, switches for garage lights can be placed anywhere in a home—in the garage, in the front entrance hall, on the upstairs landing, and even in the master bedroom—at a price the homeowner can afford to pay. In fact, remote control switches in the master bedroom and any other location can eliminate the homeowner's nightly inspection tour, simply by giving him full control of all lights from one or more convenient spots.

Yard lights, cellar lights, attic fan, and any number of lights and small appliances can now be controlled from many locations—can even be wired to give full control from a favorite easy chair.

Permits "Pathway Lighting"

Another valuable convenience, now made economical and easy to install, is planned "pathway lighting."

Under the pathway lighting plan, the remote control system follows the traffic pattern of a home, with switches in all hallways and entranceways. Wiring for this plan can be arranged so that the householder can walk into a darkened house, turning on lights ahead of him, turning out the lights in rooms he has just passed through—without retracing his steps. Outdoor lights can be wired to give pathway lighting to house and grounds.

Learn about this new advance in wiring now!

Mail Coupon

Section D39-1218
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Please send me your new bulletin about the General Electric remote control wiring system.

Name_____ Title_____

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Electrical Construction and Maintenance is written for you by a large staff of editors and consultants, each an authority on some phase of the business. They will be glad to give you expert advice and answers to your questions.

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To secure further information on new product or new catalog and bulletin items listed elsewhere in this section, use the card on the other side.

Product News

Motors (1)

A new line of life-time oil-lubricated, shaded-pole motors designed for operation in any position, shaft up, down, horizontal, or at any intermediate angle, has been announced. Designated as Type KSP, frame sizes 11 and 21, motors can be used as drives for exhaust fans, cooling fans, evaporative coolers, unit heaters, condenser cooling, and space heaters, as well as for small pumps, agitators, and blowers. Available in either open or totally enclosed construction. Ratings range from 1/40 hp. through 1/12 hp. at 115 or 230 volts, 1050 or 1550 rpm, 60 cycles. Mounting arrangements include resilient end ring mounting, resilient cradle base, and band mounting. Motors also available with four tapped holes on shaft end for end mounting.

General Electric Company, Schenectady 5, N. Y.

Instrument (2)

A new type of electronic tracing device, known as the Electracer, has been announced. It is capable of locating a defective point in wire, cable, metal pipe or any other conductor in any type of electrical installation or apparatus. Consisting of a signal generator, portable probe, receiver and headphones, it follows the principle of the generation of a signal with the signal generator, which follows a wire, cable, metal pipe or other conductor that may be imbedded in a wall, buried underground or lost in a maze of pipes and wires. The generated signal is followed with the probe and amplified by the receiver. It is heard in the headphones and the route of the conductor, point of defect or end of conductor is determined.

Special Products Company, Silver Springs, Md.

Metal Detector (3)

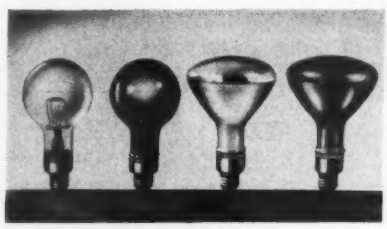
Identified as an electronic sentry designed to safeguard non-metallic products, the metal detector is used in plastics, food, confectionery, paper, rubber, textile and other industries. It can be used on conveyor installations at speeds ranging from 15 to 600 feet per minute. It is self-contained and needs only to be plugged into an electrical outlet to operate. For inspection of tall packages or large sacks of material in an upright position, an endwise mounting of detector can be applied with sensitivity and operating speed comparable to that obtained in the horizontal, inclined or sidewise positions.

Allis-Chalmers Mfg. Co., Milwaukee, Wis.

Instrument (4)

Microhm meter 151-S is a five range instrument for use in measuring low resistances in circuit breaker contacts, cable joints, busbar connections, limiters, windings, material tests, etc. Microhm ranges are 0-75; 0-750; 0-7500; 0-75,000 and 0-750,000. Instrument is powered by self-contained standard dry cells. Extra long leads, 20 ft. are provided. Dimensions are 8 by 10 by 6 inches.

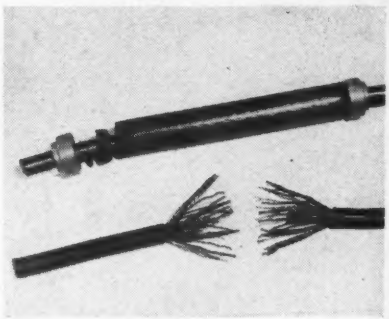
J. W. Dice Company, Englewood, N.J.



Infra-Red Lamps (5)

A new 500-watt sealed-beam industrial heat lamp has been announced. It incorporates a new type of tungsten filament. The inside of the bulb is lined with pure polished silver that acts as a built-in reflector and it is hermetically sealed and protected from dust, dirt and fumes. Other new heat lamps include sizes from 125 watts and up, each equipped with an all-mechanical base-locking construction that permanently locks the glass bulb to its base.

Amplex Corporation, 111 Water Street, Brooklyn 1, N. Y.



Cable Splice Housing (6)

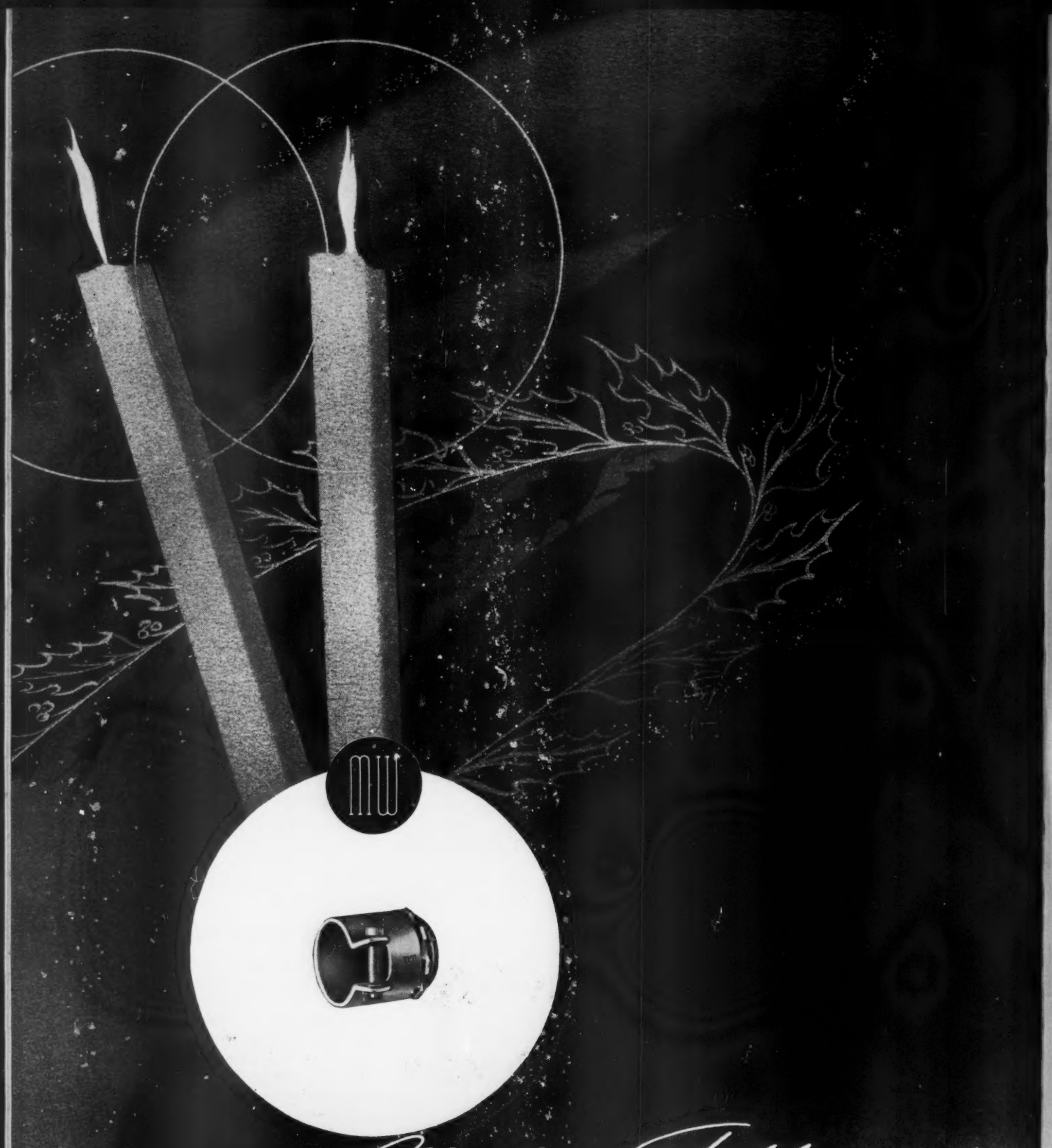
A plastic cable splice housing has been developed. It eliminates lengthy outside wrapping operations, thereby cutting splicing time. Housing is recommended for both aerial and underground installations and can be used with either rubber or neoprene cable. Main structural part of housing is a pipe made from corrosion-proof blend of synthetic rubber and thermoplastic resins. Pipe fits over cable joint. Two rubber seals are used in pipe to make a moisture-tight seal. Threaded plastic caps on each end of pipe grip the cable. Available in two diameter sizes: 1.5 inches inner diameter for cables of one inch maximum thickness and two inches inner diameter for cables up to 1.5 inches maximum thickness.

United States Rubber Company, Rockefeller Center, New York 20, N.Y.

Welding Control Equipment (7)

Two new, all-electronic, high-speed resistance welding control equipments, for synchronous and non-synchronous operation, are available. Equipments have no moving parts in power and control circuits except initiation and solenoid relays. Basic control panels consist of plug-in Rectox rectifier tube firing panel for non-synchronous units, or a heat-control firing panel for synchronous units. Basic controls include the 3-B sequence weld timer, which controls squeeze time, weld time, hold time, and off time for a single impulse spot welding. It provides non-synchronous timing with repeat and non-repeat control and non-heat control. Substitution of a precision weld-time panel for a 3-B or 5-B sequence weld timer provides synchronous precision control when heat control panel is used.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.



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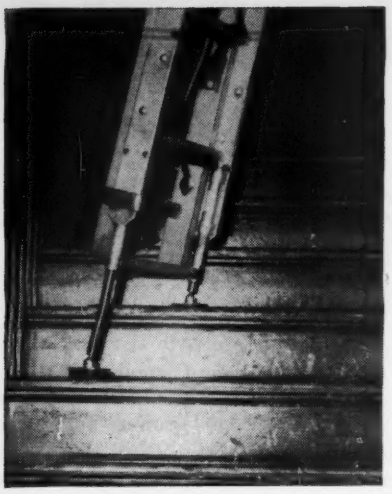
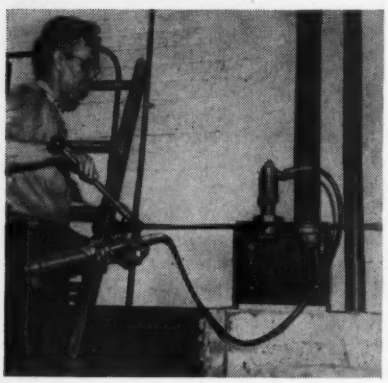


Ladder Attachment (8)

A hydraulic ladder attachment, known as Hydra-Lizer, automatically corrects unlevel ground conditions and provides maximum safety for ladder users, has been announced. Inter-connected hydraulic units displace oil from one leg into the other as ladders are erected to correct differences in terrain from hillsides to stairways. By moving a foot operated valve lever the ladder can be locked in any position desired. It is designed to be attached to all types of ladders, wood or metal, straight or flared base. Telescopic steel tubing automatically adjusts to proper width and unit can be reused on ladders of different dimension.

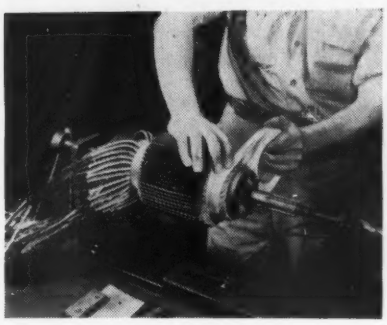
Anderson Products Co., P. O. Box 691, Tulare, Calif.



Knock-Out Punches (9)

Knock-out punches now operated hydraulically by Blackhawk Porto-Power have been announced. The new hollow ram, RC-426, connects to the standard Porto-Power P-76 pump and Z-913 hose for operation of all new and existing knock-out punches in the field. Four new knock-out punch assortments are available. SB-40 includes 6 punches for conduit sizes of ½, ¾, 1, 1¼, 1½ and 2 inch, RC-426 ram, five attachments and 19586 case. SB-41 has 10 punches, size with same range as SB-40 plus 2½, 3, 3½ and 4 inch, RC-426 ram, five attachments and 19585 case. SB-44 is a special assortment for those who already own knock-out punches and want to convert from hand to power operation. SB-43 unit is the complete hydraulic unit consisting of RC-426 ram, P-76 pump and Z-913 hose.

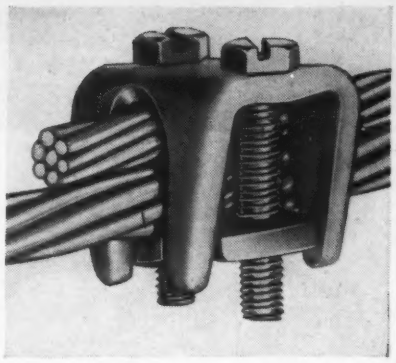
Blackhawk Manufacturing Company, 5325 W. Rogers St., Milwaukee 1, Wis.



Electrical Tape (10)

An electrical tape, "Scotch" branch No. 27, that will stand temperatures up to 300°F has been announced. It has a glass cloth backing that is fireproof, and a thermosetting adhesive that sets at 250°F in two hours, or 300°F in one hour. It contains no sulphur, which might promote corrosion. The tape is designed for use where high heat conditions are normal. Glass cloth is unaffected by moisture, will not shrink, stretch or rot, and has a tensile strength of 150 pounds per inch of width. Among uses for the tape are insulating outside transformer coils, taping down hood of armature, making splices in charger control boxes of foundry cupolas, splicing wires under cooking units of commercial ranges, and protecting feeder cables in lighting pole installations.

Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul 6, Minn.



Connector (11)

A small two-bolt clamp connecting device, known as 642 Uniclamp, has been announced. It is available with or without spacer bars and is applicable to the making of copper to copper; copper to aluminum and aluminum to aluminum connections. Some of the advantages are—made of 99.6% conductivity copper; large area of contact; easy to install; when installed, remains tight because a locking effect is created by the mechanical reaction of the riding bar and the two Duronze bolts.

W. N. Matthews Corporation, 3850 Delor Street, St. Louis 16, Mo.

Oil Cup and Gauge (12)

Combination oil cups and oil gauges can be used as a visible oil cup to replenish oil in bearings, transmission and crankshaft cases, etc., and also as an oil gauge for the purpose of checking oil levels periodically. They can be installed at any convenient distance from the machine—on the outside of housing, on other side of the wall or around corners of a room. Crystal-clear, shatter-proof plastic bottle keeps oil supply visible. Metal parts are plated for corrosion resistance. Has self-closing, dustproof filler cap for filling and cleaning. Available in 1, 2, 4 and 8 oz. capacities.

Trico Fuse Mfg. Co., 2948 No. 5th St., Milwaukee 12, Wis.

TO BE ANNOUNCED NEXT MONTH

New product items on which information was incomplete or too late to be included in this month's product news.

Starters, a new line of a-c magnetics designed to conform with latest NEMA standards.
Integral Horsepower Capacitor Motor for single phase applications with terminal inside end shield.
Fluorescent Lamps with new "DR" phosphors which bring out "full beauty" of colors and are complimentary to complexions.
Service mast for raising entrance conductors above low roof lines.

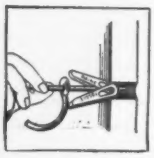
THE BEST CRAFTSMEN ALWAYS TAKE PAINE'S...

IN NEW BUILDINGS OR OLD...

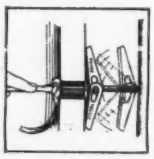
PAINE
Spring Wing
TOGGLE BOLTS
cut fastening and hanging costs

Whether you are building a new home or office or are repairing an old building you'll have no fastening problems if you use Paine Spring Wing Toggle Bolts. Spring Wing Toggle Bolts provide a secure and permanent fastening in hollow walls and ceilings and other hollow spots where it is impossible to reach the other side. They may be used in wood, gypsum, marble, lath and plaster, tile and sheet rock. They are especially useful for installing heavy shelves, partitions, wall mirrors, lights, and plumbing fixtures.

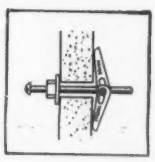
For the big user, try Paine's Toggle Bolt Clamp that grips the bolt when it is to be tightened, so it can be tightened with a screwdriver. It cuts installation time in half and saves the mechanic's fingers. Get Paine Toggle Bolts from your supplier today.



Just drill a hole. Unscrew wing. Put bolt through item to be fastened. Thread wing back on bolt. Push wing through hole.



The wing springs open when through hole. Pull on bolt while tightening to prevent wing turning.



When hanging objects that must be moved periodically, use a nut and washer as shown above.

THE PAINE COMPANY

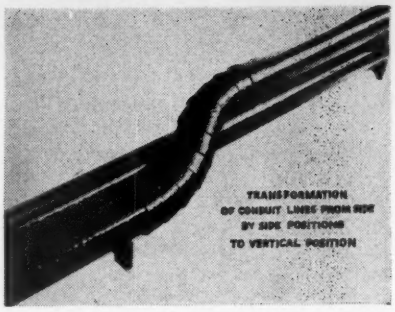
2961 Carroll Avenue Chicago 12, Illinois

OTHER PAINE PRODUCTS

Anchors Hangers Superior Feature BUILDERS SPECIALTIES

Spring Wing Toggle Bolts
Expansion Anchors
"Sudden Depth" Drills
Wood Screw Anchors
Pipe and Conduit Clamps and Straps
Hanger Iron, perforated
Expansion Shells
"Star Drills"
Malleable Shields
Special Hanging and Fastening Devices

WRITE FOR CATALOG



Bend Sections (13)

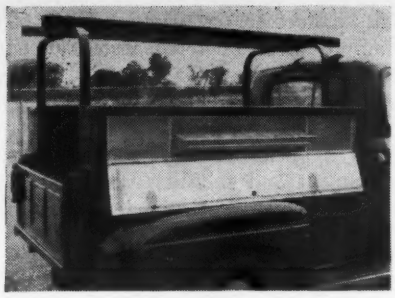
Announcement has been made of new multi-use bend sections for standard conduit (Type 1). They solve the problem for cross-overs, transformations, obstructions, and special radius applications on the job. Bends are made from short lengths of straight conduit with offset male and female joints tooled at an angle of $2\frac{1}{2}$ degrees resulting in a bend section of 5 degrees. Available for standard conduit diameters of 2, 3, 4, $4\frac{1}{2}$, 5 and 6 inches.

Orangeburg Manufacturing Co., Inc., Orangeburg, N. Y.

Floodlights (14)

Two new heavy-duty, general-purpose floodlights have been announced. Type L-84 rated at 500 watts and Type L-85 rated 1000 watts, can be used for all general-purpose applications and are available for either general lighting service or floodlighting service lamps. Complete range of NEMA types 1 through 5 is provided. The door, hinged for relamping, uses swing-type door latches. Heat-resistant door glass is cushioned in a silicone rubber gasket which wraps around edge of glass and also seals joint between door and casing. Floodlights can be provided with either narrow-beam polished or wide-beam etched reflectors. Available in three standard mountings, including a portable base.

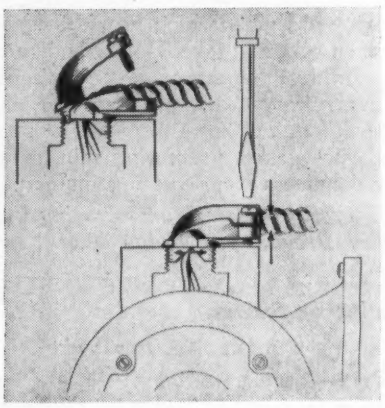
General Electric Co., Schenectady 5, N. Y.



Utility Compartments (15)

Utility compartments for pick-up bodies have been announced. Compartments are available in 72, 84 and 105 inch lengths, have either one or two door openings and can be mounted on bodies up to 1½ ton capacity. They are mounted flush to the body and do not reduce inside body area of truck. They are constructed of steel and have a rub rail moulding at top to protect doors from outside obstructions. Doors are made of two layers of steel and will not bend out of shape. Other features are flush type handles and removable trays with adjustable partitions. Compartments are supplied ready for mounting.

J. H. Holan Corporation, 4150 W. 150th Street, Cleveland 11, Ohio.

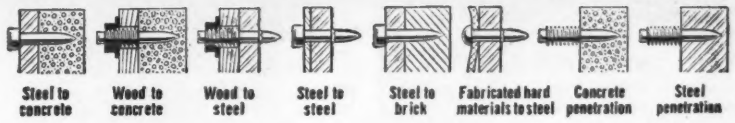


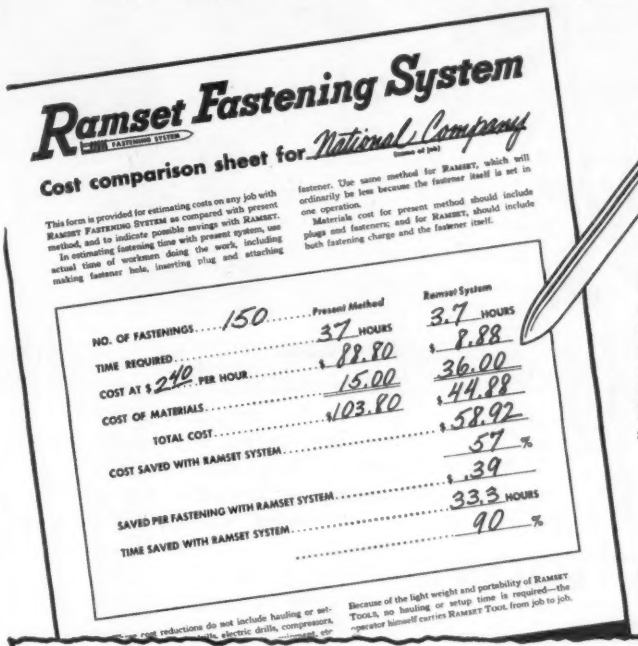
Connectors (16)

A new threaded-type 900 connector for ⅜ inch armored electrical cable has been added to the Harbot line. These connectors are installed after wiring is completed. It is made with three parallel ridges or serrations on lip of each of two parts. Serrations match standard ½ inch I.P.S. female threads in switch boxes, motor housings, condulets, and the like. By tightening two machine screws joining the two parts the serrations engage the threads for a firm connection, the cam-wedge action increasing pressure against the threads as the screws are "pulled up home." They are approved by Underwriters' Laboratories.

Unimatic Corporation, 52 East Centre Street, Nutley, N. J.

SAVE MONEY, TIME, TROUBLE ON FASTENING JOBS LIKE THESE WITH RAMSET SYSTEM




Ramset Fastening System

Cost comparison sheet for National Company

This form is provided for estimating costs on any job with RAMSET FASTENING SYSTEM as compared with present method, and to indicate possible savings with RAMSET. In estimating fastening time with present system, use actual time of workmen doing the work, including making fastener hole, inserting plug and attaching fastener. Use same method for RAMSET, which will ordinarily be less because the fastener itself is set in one operation.

Materials cost for present method should include plugs and fasteners; and for RAMSET, should include both fastening charge and the fastener itself.

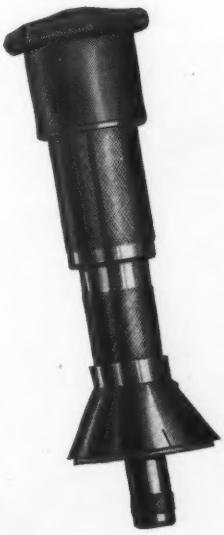
	Present Method	Ramset System
NO. OF FASTENINGS	150	
TIME REQUIRED	37 HOURS	3.7 HOURS
COST AT $2.40 PER HOUR	$ 88.80	$ 8.88
COST OF MATERIALS	15.00	36.00
TOTAL COST	$103.80	$ 44.88
COST SAVED WITH RAMSET SYSTEM		$ 58.92
SAVED PER FASTENING WITH RAMSET SYSTEM		57 %
TIME SAVED WITH RAMSET SYSTEM		$ .39
		33.3 HOURS
		90 %

...cost reductions do not include hauling or set-... electric drills, compressors, ... etc.

Because of the light weight and portability of RAMSET TOOLS, no hauling or setup time is required—the operator himself carries RAMSET TOOL from job to job.

RAMSET FASTENERS available in 65 sizes and styles of drive pins and threaded studs, made of heat-treated, work-hardened, coated steel.

FIGURE OUT FOR YOURSELF WHAT Ramset FASTENING SYSTEM CAN SAVE!



Select any job of fastening or anchoring into steel, concrete, masonry or other materials as shown above. Then, use RAMSET's free Cost Comparison Sheet to compare slow, laborious, costly chipping and plugging, drilling and tapping with the amazingly fast, simple, economical RAMSET FASTENING SYSTEM.

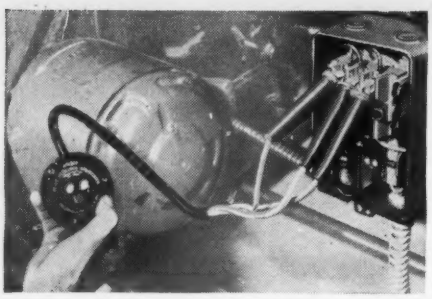
Thousands of RAMSET users are profiting every day from big savings on their fastening jobs. That's because it takes less than a minute, from start to finish to *"Ramset"* a drive pin or threaded stud, to fasten materials together or to provide an anchor. Just READY! RAM! SET! Quick as lightning, the simple, self-powered, easy-to-use RAMSETTER does the work.

INVESTIGATE RAMSET! Save money on present jobs, slash costs below competition on work you are estimating. *"Ramset"* your way into more business. Ask your local RAMSET dealer or write us for details and free Cost Comparison Sheets.

Stemco Corporation, Cleveland 16, Ohio.

© 1949 by Stemco Corp.

YOU CAN FASTEN FASTER, EASIER, AT LESS COST WITH Ramset FASTENING SYSTEM



Man-hour Saver in Checking 3-Phase Connections

The KNOPP Phase Sequence Indicator . . .

has nothing to adjust for readings

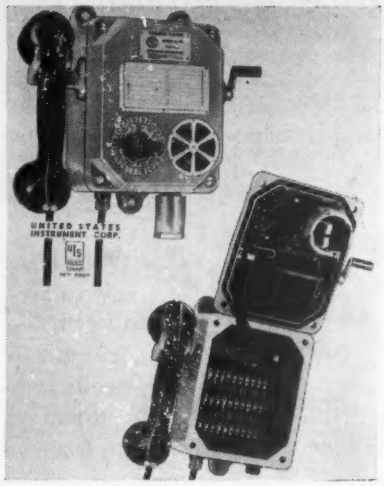
Now you can save time in checking polyphase connections and be sure they're RIGHT when you use the Knopp Phase Sequence Indicator. Just clip it on, push the safety button and determine beyond a doubt whether the phase sequence is A-B-C; or C-B-A. This dependable Knopp Phase Sequence Indicator shows phase sequence by direction of disc rotation rather than by lamps. Gives correct indication regardless of voltage or circuit conditions without changing taps or dials. It does protect equipment and assures properly connected polyphase wiring; 50 to 500 volts, 3 phase, 3 wire, 25-60 cycles.

LIGHT WEIGHT, COMPACT, SMALL

It stands up under rough field use and gives accurate and reliable service. It is made by Electrical Facilities, Inc., technical electric equipment manufacturers of 21 years experience. This indicator has a laminated bakelite housing and no exposed metal parts. It is built for complete safety. Fully insulated clips can remain attached between tests as safety push button permits indication only when needed. Weighing but 21 oz., the Knopp Phase Sequence Indicator is small and easy to carry. Price $25; with leather carrying case, $30. Order today or write for complete description.

ELECTRICAL FACILITIES INC.

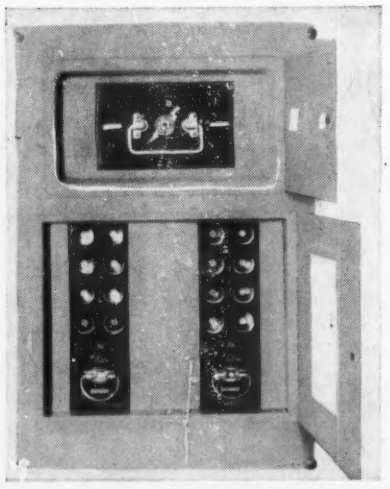
4232 Holden Street Oakland 8, California



Telephone (17)

A new line of sound powered telephones for industrial and mine use has been announced. All operating parts are mounted on cover which lifts off, leaving case free for installation of interstation wiring. "O" ring gaskets of synthetic rubber are used to seal all openings. Each station consists of a sound powered telephone handset mounted on the aluminum case, which contains a 1200 cycle magneto generator, a howler unit with connecting horn for signaling, necessary terminal blocks and, if selective ringing is desired, a rotary selector switch. Common-talking selective-ringing systems up to 24 stations, or an unlimited number of stations can be used per system. Systems operate up to 30 miles and they are weatherproof and dustproof.

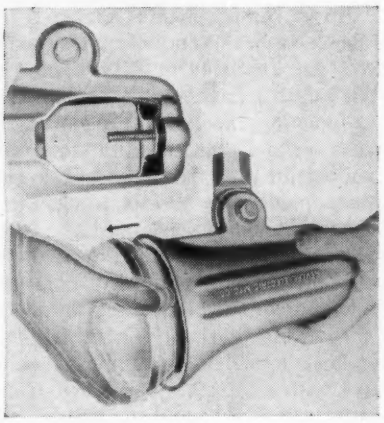
United States Instrument Corporation, 409 Broad Street, Summit, N. J.



Service Entrance Equipment (18)

A new 100 amp. double pole, fuseable pullout switch is now available. It was designed for use as an overall main disconnect switch. Available singly in compact flush, surface, or raintight steel cabinets, or in combination with up to 20 single plug fuse branch circuits and either one or two 30 or 60 amp. double pole fuseable pullout branch switches for electric range, water heater, clothes dryer, etc. These "all-in-one" combination units have many applications as service entrance equipment and sub-distribution panels for new construction and modernization of residences, stores and factories.

General Switch Corp., 49 Roebling Street, Brooklyn 11, N. Y.



Lampholder (19)

A new R-40 lampholder with floating socket has been announced. It is designed to automatically compensate for any variation in length of lamps. Mogul type socket is mounted on a spring assembly which provides up to $\frac{5}{8}$ inch give and take. Holder body and mounting fitter are of cast aluminum. Spring mounted socket pulling inwardly, establishes a firm hold against asbestos gasket preventing rain, snow or dampness from entering interior.

Revere Electric Manufacturing Co., 6009 Broadway, Chicago 40, Ill.

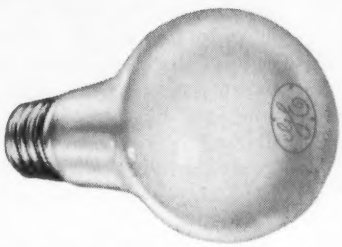
Selector Switch (20)

A new master selector switch for 24-volt remote control wiring systems has been announced. It is a combination selector switch and control switch that enables user to select any one of nine different circuits and operate them separately or, with one sweep, turn on or off all nine circuits. Switch is of rotating type, and is mounted on an ivory-colored switch plate together with a separate single "on" and "off" switch of a normally open, single pole, double-throw momentary contact type. Residential users will find switch useful in master bedroom, front and rear entrances, kitchen, or other convenient areas in the home. Industrial users will find it useful in numerous areas to control various groups of lights, small motors, or other fixture circuits. Also for controlling lights in motor courts, parking lots, bowling alleys, etc.

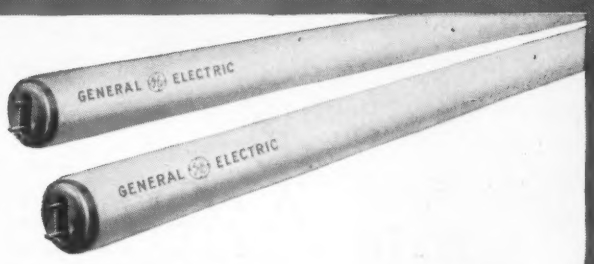
General Electric Company, Bridgeport 2, Conn.

How to make a "no man" say "yes"

EVEN if your prospect isn't in a buying mood, here's how to keep from going away empty-handed. Remind him that you handle General Electric lamps and just ask for the order. Every customer you call on needs lamp bulbs. And since G-E lamps are tops in preference, it often only takes a suggestion from you to clinch a sale.

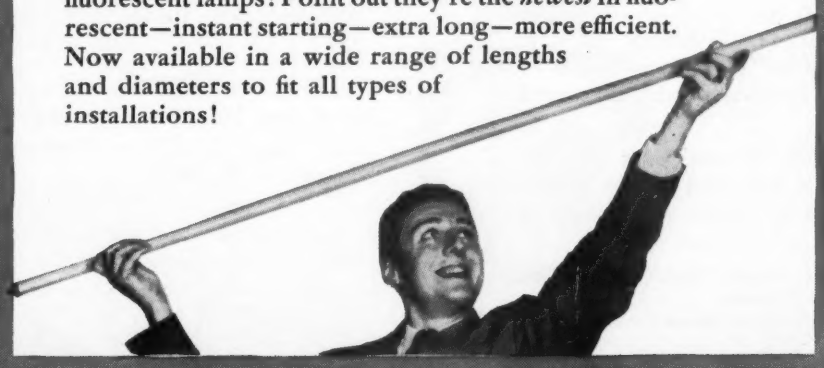


JUST ABOUT EVERYONE uses incandescent lamps somewhere in his plant or office. G-E makes all types and wattages for every requirement.



THE REPLACEMENT MARKET for fluorescent lamps is getting bigger every day. Help your customers get all the light they pay for by reminding them to replace worn-out tubes with new General Electric fluorescents.

MORE AND MORE places being lighted by G-E *slimline* fluorescent lamps! Point out they're the *newest* in fluorescent—instant starting—extra long—more efficient. Now available in a wide range of lengths and diameters to fit all types of installations!



AND DON'T FORGET G-E miniature lamps! They can add up to a good-sized order because they're used in so many ways—in elevators, indicators, instruments — hundreds of other places.

G-E LAMPS

GENERAL ELECTRIC

SAFETY FIRST LAST ALWAYS

WITH ARROW POLARIZED DEVICES

2, 3, and 4-WIRE — 10-60 Amps. — 250 Volts

Duplex Receptacles • Cord Grip Caps
Cord Connectors • Surface Receptacles
Armored Cord Grip Caps • Flush Receptacles
Rubber Cord Grip Caps • Range and Power Outlets

And the above represents only part of our dependable line of Bakelite, Rubber and Composition polarized devices. From cap to receptacle, it's a *safety first, last* and *always* line. The longer ground-blade makes contact *first* — breaks *last* — is *always* polarized while in operation. Wide cap blades fit snugly into wide receptacle slots; positive polarity is assured *every time.*

Write today for our new wiring device catalog. It tells you more about our line of dependable polarized devices — puts a ready reference to *a complete line* of wiring devices at your finger tips.

Branch Offices: Boston, Chicago, Dallas, Denver, Detroit, Los Angeles, New York, Philadelphia, San Francisco, Syracuse.
In Canada: Arrow-Hart & Hegeman (Canada) Ltd., Mount Dennis, Toronto.

CALL YOUR NEARBY ELECTRICAL JOBBER FOR PROMPT SERVICE

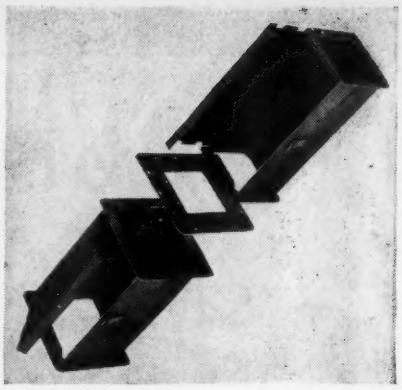
Please address your specific requirements to:
1712 LAUREL STREET
HARTFORD 6, CONN.

WIRING DEVICES

ARROW ELECTRIC DIVISION

ENCLOSED SWITCHES

THE ARROW-HART & HEGEMAN ELECTRIC COMPANY
HARTFORD, CONNECTICUT



Bushing (21)

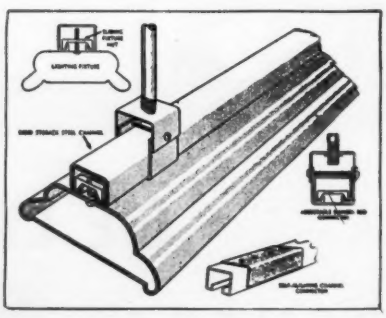
A reducer bushing that will provide an easy way to connect a 6-inch wireway to a 4-inch size has been added to this line. The reducer is made of heavy metal 7½ inches square with a 4-inch opening in the middle. Fastened by bolts to the flanges of the wireways, reducer forms a rigid connector between the two sizes. The sides of the wireways have knockouts, ranging in diameters from 1 inch to 2½ inches, located 3 inches apart. A hinged cover facilitates easy access for wiring.

Keystone Mfg. Co., Center Line, Mich.

Motors (22)

New type SK, direct-current Life-Line motors, in one to 30 hp. ratings, are available. They have heavy steel end brackets and pre-lubricated sealed-for-life ball bearings. In frames 203 to 365, motors are available for constant, adjustable, or varying speed applications, for either continuous or intermittent service. They can be supplied with shunt, compound, or series windings. They are designed for operation from 115, 230, 550 or 660 volts.

Westinghouse Electric Corporation, Pittsburgh 30, Pa.

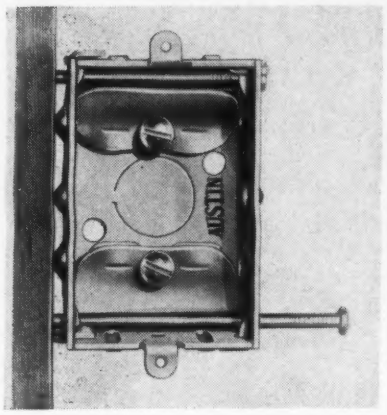


Hangers (23)

Adjustable Tru-line hangers for use in installing long continuous or interval-spaced fluorescent lighting fixtures

have been announced. Basic features of new installation method are: (1) special Storack steel channel in standard 20 foot lengths or less. (2) special nut fittings that slide and adjust any place along channel slot. (3) A "U" shaped connector fitting for attaching full or fractional channel lengths together. (4) A two-piece adjustable yoke fitting that slips around channel and holds it to ceiling hanger rods.

American Steel & Iron Works, 58th and South Lowe Ave., Chicago 21, Ill.



Switch Box (24)

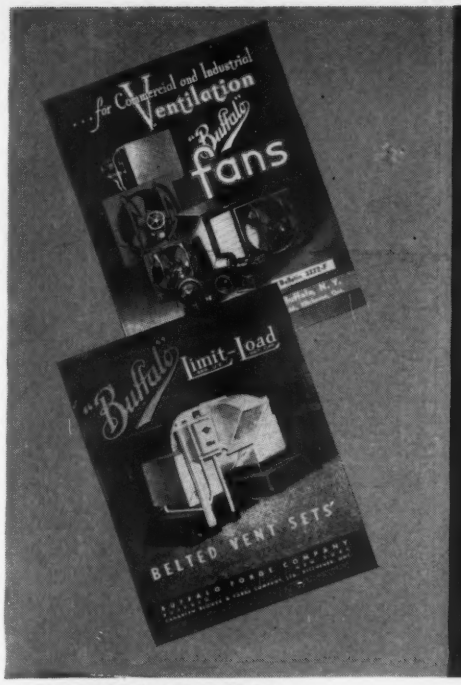
An improved LR switch box has been announced. Nail holes located in box sides eliminate necessity for a mounting bracket. Nail heads are driven in tight to keep box from getting out of line. Three correctly located nubs facing outward on each side of box assure alignment by keeping box from tilting when nailed to studding. First nub is $\frac{7}{8}$ inch from front of box to permit adjustment for wallboard or plaster.

M. B. Austin Company, Northbrook, Ill.

Louver Lighting (25)

Different applications of a new form of louver lighting, known as Fota-lite, have been announced. It is manufactured as a thin pane of transparent glass. Throughout its length and depth are engrained, by means of a photographic process, white opalescent vanes in symmetrical, criss-cross pattern. When in use in a light fixture, this material allows direct illumination to pass through, at the same time blocking direct light angling to the side. The translucence of the louvers creates a gentle diffusion of indirect light at side angles. Glare is eliminated due to the 45 degree light cut-off possessed by Fota-Lite.

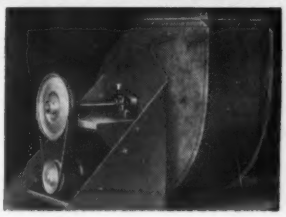
Corning Glass Works, Corning, N. Y.

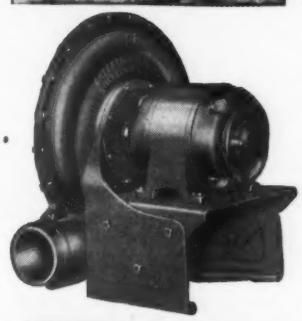


YOUR PICK of PROVEN FANS IN THE COMPLETE "BUFFALO" LINE

"L" BREEZO
Complete unit for exhausting from hoods and vats—motor isolated from moisture

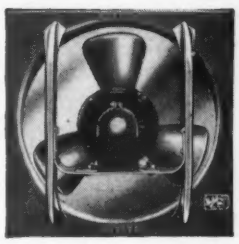
BELTED VENT SETS
Light, versatile units for duct ventilation work—non-overloading, efficient

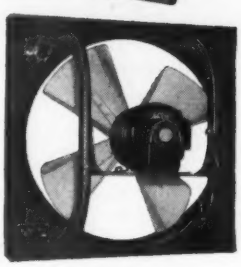




"E" BLOWERS
Husky blowers-exhausters for forge and furnace blowing, tool cleaning, cupola work

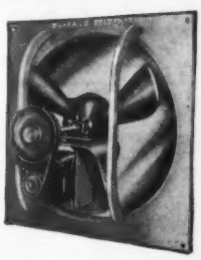
BREEZO FANS
Heavy-duty, easily installed panel wall fans to ventilate small areas at low cost





"NV" HEAVY-DUTY BREEZO FANS
For heavy-duty ventilating work against up to ¼" s.p. Easily installed in walls

BELTAIR FANS
For free air delivery up to 19,000 cfm. 24" to 48" sizes. Wall-mounted. Trouble-free



WRITE FOR BULLETINS 3222-F and 3720 TODAY!

BABY VENTS SETS
Movable conoidal fans for small-area ventilation or exhausting. Can be duct-mounted.

"Buffalo" First For Fans

BUFFALO FORGE COMPANY
520 BROADWAY BUFFALO, NEW YORK

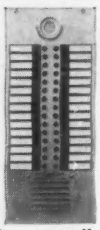
CANADIAN BLOWER & FORGE CO., LTD., Kitchener, Ont.

Branch Offices in all Principal Cities

PANEL BREEZO FANS BELTED VENT SETS BELT-AIR FANS
BREEZ-AIR ATTIC FANS "L" BREEZO FANS "NV" BREEZO FANS

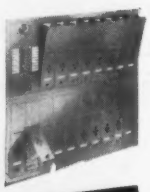
. . . one of these Couch Systems will dove-tail with your specifications

When plans call for mail boxes and inter-suite 'phone systems, look to Couch for equipment to fill the bill. If you don't find the type you want illustrated below, a Couch representative will gladly assist you.



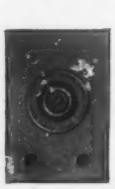
Vestibule Telephones

Type 74C — Cordless type illustrated is the most popular unit . . . no protruding attachments . . . easily installed.



Tilting Mailboxes

Type 73 — Post Office approved mail boxes for use with Vestibule Telephone. Features include frame separate from boxes for easy installation and tenant doors which can be set in open position for easy removal of mail.



Suite Telephones

Type 47—Cordless suite phones make a neat installation and can be provided to give a variety of service. Type 52, with the handset type instrument, provides greater convenience for particular installations.

S. H. COUCH CO., Inc.

DEPT. 812F NO. QUINCY 71, MASS.

Private Telephones for Home and Office . . . Hospital Signaling Systems . . . Apartment House Telephones and Mailboxes . . . Fire Alarm Systems for Industrial Plants and Public Buildings.

Scaffolding (26)

Sectional scaffolding can be assembled into a large variety of frames, towers and platforms from a few frames, braces and putlogs. Illustrated above is a 5 by 7 foot rolling tower made up from standard end frames, cross braces and casters. Erection and dismantling is speeded by a special locking device which eliminates bolts and wing nuts. Tested for 50 lbs. per square foot live load with safety factor of four.

Wilson-Albrecht Co., Inc., 3565 Wooddale Avenue, Minneapolis 16, Minn.

Transformers (27)

Four new sizes have been added to this line of Pole Star distribution transformers. They are constructed of cold rolled steel, lighter in weight and smaller in dimension than the transformers they replace. Embodying a new wound core design with an inherent low exsiting current, single phase transformers are made in sizes 37½ to 100 kva., 14400 volts and below, 60 cycles, OA, conforming to A.S.A. and E.E.I.-N.E.M.A. standards.

Pennsylvania Transformer Company, 808 Ridge Ave., Pittsburgh 12, Pa.

Fluorescent Lamp (28)

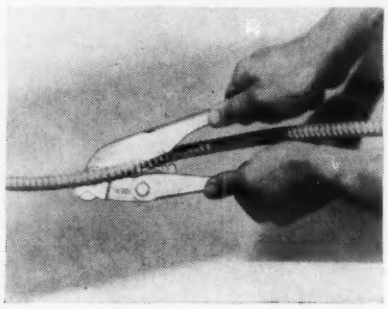
A new improved fluorescent lamp, known as DXC for double extra duty, has been announced. It features a double cathode, and a new type of phosphor powder, which is certified beryllium free. It gives greater lumen output on the same wattage, without the premature discoloration. More positive starting is another feature of the DXC. Lamps have a life rating of 10,000 user hours. It operates on any standard fluorescent fixture. It is also supplied in all standard colors for fluorescent lighting.

Duro-Test Corporation, North Bergen, N. J.

Electric Saw (29)

A new portable electric saw, weighing eleven pounds, has been introduced. It is especially suitable for plant maintenance and repair in all types of industry, where it can be used for cutting metal, asbestos, concrete, stone and tile. It is equipped with ball and roller bearings. This six-inch saw has a one hp. motor. Features include a depth gauge which adjusts from a "mere scratch" to a two-inch straight cut; a rip guide, which provides control for long cuts; and a mitering adjustment, from zero to 45 degrees, with a bevel cut of 1⅜ inches.

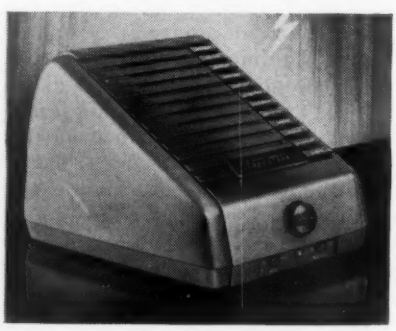
Milwaukee Electric Tool Corp., Milwaukee 8, Wis.



Armor Cutter (30)

This pocket-size tool cuts two or three No. 10, 12 or 14 BX cable, either large or small diameter. Place the cable in the jaws and squeeze handles, then twist cable and pull it apart. It cuts cleanly and quickly without injuring wire insulation. Blade may also be removed for sharpening or for replacement, if necessary. Tip of tool is designed for cutting wire after armor has been cut and removed.

Ideal Industries, Inc., 1648 Park Avenue, Sycamore, Ill.

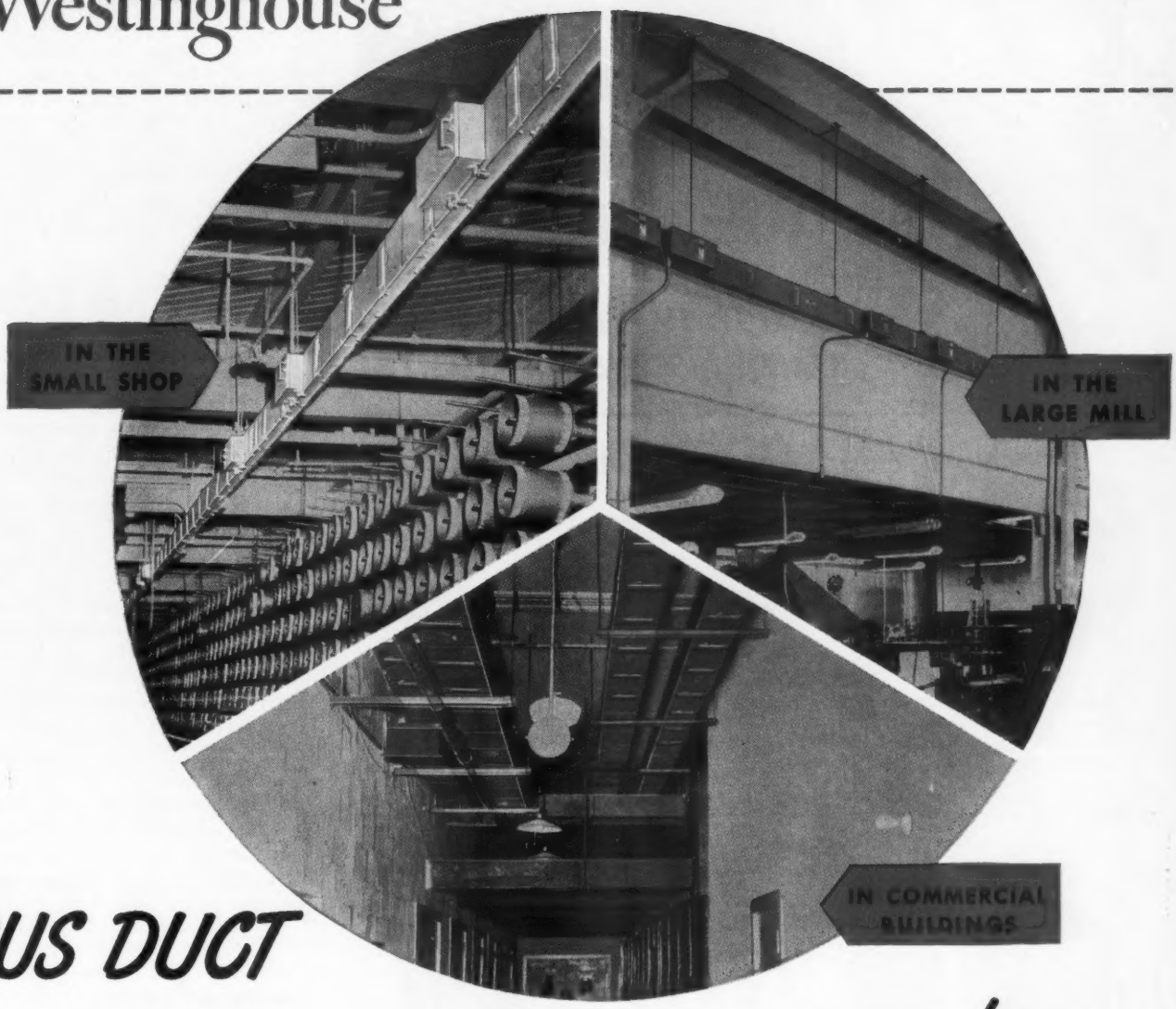


Intercommunication System (31)

Automatic audio-visual signalling, called "Chi e-Matic" is a feature of this new intercommunication equipment. Pressing any button automatically announces the call at the sta-

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



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From the small machine shop, using only 20 or 30 feet of duct, to giant plants employing over 15,000 feet, bus duct makes a distinct improvement in secondary power distribution.

Automotive plants; metalworking shops; steel and textile mills; food processing plants; department stores; office buildings; these are only a few of the thousands of places enjoying bus duct's low-cost installation, reduced maintenance and availability of power where needed.

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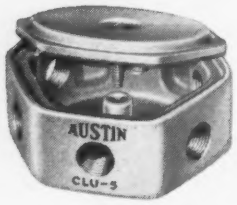
COMPLETE 5-LAMP ASSEMBLY

USE THE AUSTIN ALUMINUM CLUSTER LIGHTS!

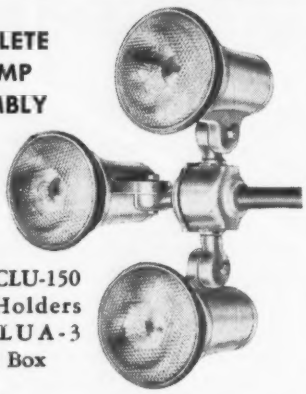
CLUSTER SPLICE BOX



CLU-5

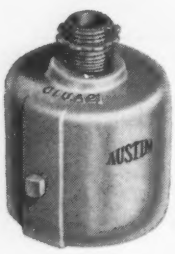
6 tapped holes, 2 plugged. Built-up center post keeps screw from wires. Self-centering hole in post for easy screw insertion.

COMPLETE 3-LAMP ASSEMBLY



3 No. CLU-150 Lamp Holders with CLUA-3 Terminal Box

2 INCH POLE FITTER

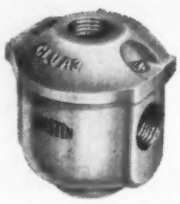


CLUA-21

Slip fit adapter for 2" pipe, with set screw and ½" close nipple.

CLUSTER TERMINAL BOX

For upright or horizontal position—one, two, or three lamps. Can be used on top of CLU-5 splice box for 7-lamp combination.



CLUA-3

CLUSTER LAMP HOLDER WITH ASBESTOS GASKET FOR PAR-38 LAMPS

150 Watt all-aluminum lamp-holder. Back plate easily removed for socket replacement.

CLUSTER SPLICE BOX FOR 7 LAMPS

CLU-7

Body with 7 drilled holes, 5 in top and 2 plugged in back.

WRITE FOR INFORMATION AND PRICES

The M. B. Austin Company
NORTHBROOK, ILLINOIS

tion selected by means of a modulated chime and signal light. Full trunkage switching, allows as many simultaneous conversations as there are pairs of executive stations, and also protects conversants from eavesdropping or cutting-in. Four types of systems using the basic units are available. It is particularly suited for all types of offices, factories, plants, stores, warehouses, hospitals, schools, hotels, churches, etc.

Executone, Inc., 415 Lexington Avenue, New York 17, N. Y.

Control (32)

A new self-contained remote-controlled utility unit has been designed for the remote control of small motors, heating and lighting equipment, athletic courts, swimming pools, prowler protection lights, and other outdoor lights. Housing and snap-on weatherproof cover is made of aluminum. There are two compartments inside the unit, the upper compartment for the low-voltage wiring and the lower one for the 125 volt connections, as required by NEC. There is a screened drain in the bottom for condensation. It can be mounted with two lag or machine screws, $6\frac{3}{4}$ inches apart. Relay has a rated capacity of $\frac{1}{3}$ hp., 15 amp., 125 volts a-c, or 5 amp., 250 volts a-c. Transformer requires 125 volts a-c. Unit is approved by Underwriters' Laboratories.

General Electric Company, Bridgeport 2, Conn.

Fluorescent Lights (33)

New outdoor all-weather fluorescent lights, known as Post-Lites, have been announced. A brilliant "white" light fans out horizontally. Old light posts regardless of type can be converted with single lites or cluster lites of lamp-type models. For new installations, 2 inch pipe set in concrete is only base construction required. Operate on 110 and 120 volts.

W. H. Long Company, 108 W. Illinois St., Chicago 10, Ill.

Scaffold (34)

A new electrically operated extension scaffold has been introduced. A height up to 26 ft. can be reached. Roller bearing swivel casters on all four legs make it easy to maneuver in tight places. It may be extended to any desired height. The welded steel safety rail is stored within U frame.

Atlas Industrial Corp., 849-39th Street, Brooklyn 32, N. Y.

Fluorescent Lamp (35)

Candlelite, a new color in fluorescent lighting, has been developed. The new light in which the blue values common to fluorescent lights have been depressed and red values enhanced is complimentary to complexions and is efficient. Candelite gives the effect of the warm, soft glow of a candle flame. Recommended for use in homes, offices and beauty parlors.

Duro-Test Corporation, North Bergen, N. J.

Product Briefs

(36) A slotted-bolt **connector,** which is cold forged of 99.6% conductivity electrolytic copper and which is applicable to No. 10 and smaller conductor has been announced by W. N. Matthews Corp., St. Louis, Mo.

(37) A new fractional hp. **dynamometer set** for industrial and school use has been announced by General Electric Co., Schenectady, N. Y. . . . (38) Lathe centers with 60° tungsten **carbide tips** are being manufactured by South Bend Lathe Works, South Bend, Ind. . . . (39) Tinnerman Products, Inc., Cleveland, has announced a new **blind fastener,** known as the bolt-retaining speed clip, for attaching small parts and accessories to metal panels.

(40) Signal Electric Mfg. Company, Menominee, Mich., has announced the addition of two new 6-inch **bench grinders** to this line. . . . (41) Westinghouse Lamp Division, Bloomfield, N. J., has added neon gas to the 25-watt **fluorescent lamp.** . . . (42) G. C. Wilson & Company, Chatham, N. J., has developed a new **electronic timer,** known as Cyclo-Flex.

(43) The M. & W. Electric Mfg. Co. of East Palestine, Ohio, has announced a new packaged **service entrance kit.** . . . (44) Two new stationary **drill stands,** which are designed to handle any signal drill, has been announced by Signal Electric Mfg. Co., Menominee, Mich. . . . (45) A single-phase, instantly reversing ⅛ hp. **electric motor** has been developed by Iron Fireman Manufacturing Co., Portland, Ore.

(46) Westinghouse Electric Corporation, Pittsburgh, Pa., has announced an improved, self-contained **load tap changer.** . . . (47) Solar Electric Corporation, Warren, Pa., has developed a new ceramic colored R-40 **reflector lamp.** . . . (48) Announcement has been made of new multiple-unit type **voltage stabilizers** for capacities in excess of 2 kva. by Raytheon Manufacturing Co., Waltham, Mass.

(49) A new line of Permacel pressure sensitive **electrical tapes** has been introduced by Industrial Tape Corp., New Brunswick, N. J.

Again Irvington leads the way . . . with the most complete line of Class "H" insulations obtainable. Now, manufacturers faced with high temperature problems can successfully meet each specific requirement from this broad line. Designers, too, faced with the need to design more compactly, or reduce weights, can select insulations exactly suited to their needs. These Irvington Class "H" insulations are furnished in many thicknesses, and widths up to 36". Complete information, and generous samples, gladly furnished on request.

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VISIT the Plant Maintenance Show. See the exhibits. Examine and compare the plant equipment and services that make low-cost production possible.

ATTEND the technical sessions. Listen to discussions of the newest and best ways to keep your plant operation at peak efficiency.

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YOUR SHOW . . . for the first time you and other key members of industry's cost-cutting team will have your own show.

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Show Management: CLAPP & POLIAK, Inc., 341 Madison Avenue, New York 17, N. Y.

Catalogs, Bulletins and Engineering Data

(50) ANCHORING DEVICES including expansion bolts, screw anchors and masonry drills are contained in illustrated handbook catalog S-10. The Rawlplug Co., Inc.

(51) TONG METER of pocket size for measuring volts and amperes is discussed in 2-color file sheet 109. Pyramid Instrument Co.

(52) ELECTRIC HEATER catalog 50 discusses strip heater elements, finstrips, air blast and oven units, ring, cartridge and tubular elements, preheaters, blowers, thermostats and miscellaneous hardware. Edwin L. Wiegand Co.

(53) RESIDENTIAL LIGHTING, discussed room by room, is presented in 36-page full color catalog R-60 containing sketches and description of incandescent and fluorescent units. Globe Lighting Products, Inc.

(54) CABLES and cable sizes of asbestos-varnished cambric, types AVA, AVB and AVL are subject of booklet 19-269 including step-by-step instructions on figuring load current, voltage drop and selection of cables for lighting and motor loads. General Electric Company.

(55) POWERSTAT light dimming equipment for motion picture theatres is discussed in pocket-size booklet illustrating applications for full line of remotely-controlled units. Superior Electric Co.

(56) M-G SETS for large industrial plants, laboratory use and electrical devices requiring special frequencies and voltages are presented in form 549-MG. Kato Engineering Co.

(57) WIRING DEVICES such as receptacles, switches, pilot lights and lampholders are discussed in 4-page 2-color folder. Monowatt, Inc.

(58) POWER TOOLS are discussed and pictured in catalog E2. Independent Pneumatic Tool Co.

(59) LOUVERED CEILINGS using aluminum grids are described, pictured and specified in file folder. Kawneer Co.

(60) TELEPHONES using no outside source of power, in handset and headset models, recommended for industrial purposes are described in catalog 400A which includes wiring diagrams and mounting instructions. United States Instrument Corp.

(61) WIRE, CONDUIT AND CABLE data are provided in 86-page catalog 500, leatherette bound, including information on rigid and thin-wall, flexible and armored conduit. Triangle Conduit and Cable Co.

(62) LUMINOUS TUBE TRANSFORMERS are presented in 12-page catalog 491-55 illustrating indoor, outdoor and weatherproof units of cold cathode, core and coil, hanging and standing types. Jefferson Electric Co.

(63) CUTTING COSTS with electrical controls, containing 45 case studies, is subject of 65-page booklet, fully indexed both alphabetically and by industries. Photoswitch, Inc.

(64) FLOODLIGHTS for heavy duty are dimensioned, priced and specified in file folder GEC 537. General Electric Co.

(65) GENERATORS, their characteristics, application and installation methods, are contained in 8-page 2-color bulletin 2200-PRD-196. Electrical Machinery Mfg. Co.

(66) DEVICES such as glow pilot lights, high-voltage meters, volt-amp testers, current indicators and accessories are discussed and priced on file sheet form 13-9-49-5M. Industrial Devices, Inc.

(67) HIGH AMPERE AVC CABLE with tables showing current carrying capacities, conduit sizes required, directions for using conductor calculator and graphs for general power wiring is subject of catalog and data book. Rockbestos Products Corp.

(68) AIR-COOLED TRANSFORMERS, for all-purpose distribution applications indoors and outdoors, are discussed in bulletin 49-ACO. Marcus Transformer Co., Inc.

(69) LIGHTING EQUIPMENT selection guide, clarifying the application of 12

basic industrial lighting systems for general lighting, covers wide range of seeing tasks with illuminating requirements from 10 to 150 footcandles. Benjamin Electric Mfg. Co.

(70) ELECTRIC DRILLS for construction, installation, production and maintenance work are described, together with accessories for grinding, in file sheet 493. Wodack Electric Tool Corp.

(71) REFLECTORS and flood lights, with repair parts and accessories, are discussed in 46-page catalog FL49. S & M Lamp Co.

(72) TRANSFORMER catalog AC 178 presents units from 1/10th to 50 kva. and includes wiring diagrams, discussion of high voltage distribution, operation of 115 volt equipment for power circuits and balancing voltage on 3-wire systems. Acme Electric Corp.

(73) CENTRIFUGAL PUMP installation and operating manual 812A discusses proper pump location, foundation, alignment, priming, piping, adjustment and repair. The Duiron Co., Inc.

(74) MIDGET LIGHTS for use with 75-w R30 lamps are subject of file sheet 127 which pictures, dimensions and prices swiveling adjustable mountings, louvers and lenses. Swivelier Co., Inc.

(75) VOLT AMMETER with dual a-c range is presented in instruction manual 6900. Airserco Mfg. Co., Inc.

(76) QUICK LABEL pipe markers for identifying small diameter pipes are discussed in bulletin 144. W. H. Brady

(77) PIPE THREADING with portable tool is discussed with text, drawings and photographs in file-sized 2-color folder. Muncie Gear Works, Inc.

(78) ELECTRIC HAMMERS for drilling concrete, brick and rock are described in folder section 34.66 P L & R, including description of hammer accessories and various self-contained units. Syntron Co.

(79) ADJUSTABLE BAR HANGERS for quickly positioning and fastening switch and outlet boxes between studs are illustrated and described in file sheet. Fast Lox Sales Co.

(80) ALL-METAL FLUORESCENT luminaire for schools and general commercial lighting, "the Berkeley", is presented with dimensions, mounting details, footcandle data, coefficients of utilization and performance characteristics. The Miller Co.

REDUCE YOUR NUT-RUNNING TIME as much as 90% with Ingersoll-Rand

ROTARY ELECTRIC IMPACTOOLS

Size 4U—3/8" bolt dia.
Size 8U—5/8" bolt dia.

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Production Job . . . .

A fabrication process required removing rusted and cement coated nuts from 5/8" steel rods. With hand wrenches 60 units were turned out in a day. The Impactool jumped production to 150 units per day and the $197 tool paid for itself in less than 11 days.

Maintenance Job . . . .

Servicing transformers required the removing and replacing of transformer shields. Hand wrenches took 90 minutes; the Impactool did the job in only 9 minutes. The $110 Impactool paid for itself in less than 10 days.

Construction Job . . . .

A western building contractor used 2 Impactools to drive 1/2"x4" lag screws and run nuts on 3/8" bolts during house construction. The Impactools paid for themselves in the construction of 5 houses.

Versatile Impactool Saves 64 Man Hours on One Operation . . . .

Hand tools took 80 man hours to roll 300 3/4" boiler tubes. The Impactool, with a special tube rolling attachment, cut the time to 16 man hours. The tool costing $165 paid for itself in 13.8 hours' use.

Ask your distributor for a free demonstration.

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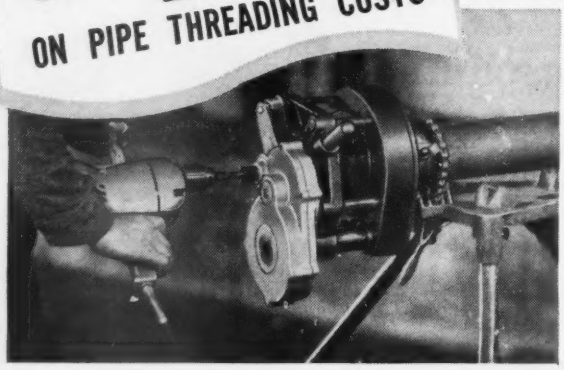
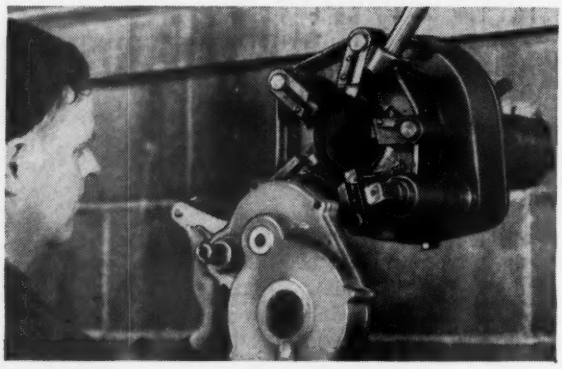
PORTA-Drive PIPE THREADER

Saves time, cuts costs for Craftsmen Everywhere

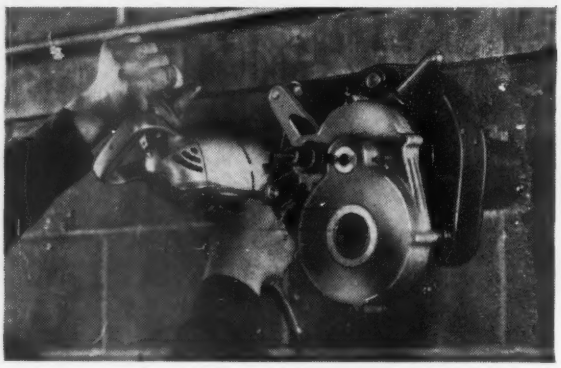
SAVE 70% OR MORE ON PIPE THREADING COSTS



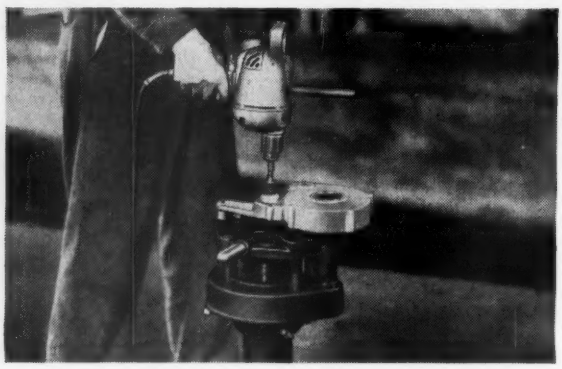
PORTA-DRIVE makes your own dies fully automatic—enables you to thread up to eight inch pipe on the job—using a vise or laid on the open floor.



PORTA-DRIVE weighs only 14 lbs.—goes to the job with you in your tool kit—attaches to any standard die with a special, furnished adaptor yoke.



PORTA-DRIVE makes pipe threading faster and easier everywhere—even threads broken pipe in walls, corners, ditches and near machinery.



PORTA-DRIVE allows you to thread pipe in any position—horizontal, vertical or on an angle. Power is provided by your electric or air drill.

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We feel that every plumber, electrician and maintenance man throughout the country should actually see PORTA-DRIVE thread pipe under difficult conditions to fully appreciate this truly revolutionary tool. By merely mailing the coupon below, you will receive a free demonstration and complete information on the advantages to be gained with PORTA-DRIVE.

PORTA-DRIVE enables you to thread up to eight inch pipe on the job! That means no more unnecessary trips to the shop or truck to thread pipe. You'll be able to handle more work—more efficiently—with less expense and greater profits—when using PORTA-DRIVE.

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PORTA-DRIVE costs less—by hundreds of dollars—than other automatic pipe threaders—yet it outperforms the most expensive for use on the job. Many are finding that PORTA-DRIVE pays for itself on the first important job. Put PORTA-DRIVE to work for you as soon as possible by mailing this coupon today.

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Without any obligation on my part, please arrange for my free PORTA-DRIVE pipe threader demonstration.

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F. N. M. SQUIRES
Chief Inspector
New York Board of Fire Underwriters
New York, N. Y.
and
GLENN ROWELL
Electrical Engineer
Fire Underwriters Inspection Bureau
Minneapolis, Minn.

Questions on the Code

Grounding Equipment

Q. *We have decided to install the new style Bryant Cat. No. 5262 parallel T-slot receptacle with the ground plug for all convenience outlets in one of our new laboratory buildings.*

Under the National Electrical Code, Article 250, Paragraph 2553, we are of the opinion the grounding conductor for circuits can be used for grounding equipment, conduit and other metal enclosures, as indicated by this paragraph. Further, Paragraph 2561 states that the grounded circuit conductor on the load side of the service switch shall not be used for grounding equipment, metal raceways, etc.

We are using a 3 phase, 4 wire, solid neutral lighting system, with 208 volts between phases and 120 volts to ground. We desire to ground the plug on this special receptacle to the neutral on the lighting system which is in itself a complete solid copper ground to the transformer secondary.

One reason for our desiring to do this is that our raceways are made up of several short sections of Greenfield, with not too secure a connection between outlet boxes and the Greenfield conduit. In the past where a considerable amount of Greenfield has been used, periodic inspection reveals several of these connections are coming loose. Will you please clarify our proposed method of grounding the ground plug on these receptacles, which in turn would be used for grounding all portable equipment with the special 3 pole plug.

Please clarify for us the present Code ruling on a bare solid neutral conductor used in a 3 phase, 4 wire system. We have not located definite commitments on this in the present 1947 Code, other than for the main service entrance, the solid neutral can be either insulated or grounded. We are of the opinion there is no objection to running a bare neutral wire on the secondary and branch circuits throughout the entire lighting system.—R.E.P.

A. It is not permissible in the National Electrical Code to use the grounded neutral of a circuit for grounding equipment, conduit or other metal enclosures, motor frames, etc. This is directly prohibited by Section 2561. If, as is mentioned in the above question, it is found that loose connections are showing up between outlet boxes and flexible metallic conduit, it would be entirely proper that a grounding conductor, separate from the grounded neutral conductor, be run throughout the conduit system, which may be connected to the outlet box and to the grounded pole of the grounding receptacle and then of course at the service, to the equipment ground.

A bare solid neutral conductor is permissible according to Section 2303a in the service running to a building but must not extend outside of the service equipment.

Section 3102 requires insulation on all conductors except when specifically permitted in the Code. Those permissions occur in Article 338 when certain types of service entrance cables are permitted to be used for range and domestic-water heater circuits or as feeders from a master service cabinet to supply other buildings if certain conditions are met. This is found in Section 3382 and it will be noted that while the grounded (neutral) conductor is without individual insulation, the cable itself has to have a final non-metallic outer covering, which, while not being considered insulation, is still a non-metallic covering.—F.N.M.S.

Floodlights in a Wash Rack

Q. *We have been called back on a job in a garage where we installed several floodlights in a wash rack because the inspector claims we have to run our thin wall out ½ inch from the walls. The lamps are just four feet above the floor and are in water tight housings, so we were proud of our job. Is this ½ inch business really a Code rule and why?*—L. B.

A. Yes, the Code does require that conduit or E.M.T. be spaced out from the wall whenever it is located on a wall or any other supporting surface where walls are frequently washed or where considerable moisture is present. This will be found under Sections 3464, 3484 and 3732. The first two sections refer to rigid and E.M.T. and the last section pertains to cabinets and cutout boxes. The 1947 edition of the Code required ½ inch clearance and that is now amended to ¼ inch, the amendment being effective as of November 1, 1949.

The clearance requirement has been placed in the Code to reduce corrosion of the raceways and lessen the likelihood of moisture entering the system. The ½ inch requirement which appeared in the Code for the first time in the 1947 edition has been reduced to ¼ inch as further experiments have indicated that the lesser clearance is all that is necessary.—G. R.

Carrying Capacity of Conductors

Q. *I know the Code says that one can place up to 30 conductors in a wireway, but I can find nothing in the Code that limits the amperage on the conductors as the number are increased. Some time ago I placed 24 ungrounded conductors and 12 neutrals in such a metal wireway and the insulation cooked in a short time and yet the load did not reach the limits shown in Table No. 1 of the Code. How can we figure the carrying capacity in such a condition?*—L. M.

A. The answer to your question is not found in the present Code and no doubt the Code is at fault in not containing rules for determining the safe carrying capacity of conductors when up to 30 may be placed in a single wireway. Possibly the fact that wireways differ greatly in their ability to dissipate heat given off by the conductors justifies the fact that no rules are contained in the Code.

In the notes following Table 2 in Chapter 10 the Code does state that "In no case shall conductors be associated together in such a way with respect to the kind of a circuit, the wiring method employed, or the number of conductors, that the limiting temperatures of the conductors will be exceeded." This rule makes it necessary for the contractor planning a wireway installation

You can do every kind of soldering with this new 250 watt Weller Gun. Power-packed, it handles heavy work with ease—yet the compact, lightweight design makes it equally suited for delicate soldering and getting into tight spots.

Pull the trigger switch and you solder. Release the trigger, and off goes the heat—automatically. No wasted time. No wasted current. No need to unplug the gun between jobs. 'Over and under' position of terminals provides greater visibility with built-in spotlight. Extra 5¼" length and new RIGID-TIP mean real soldering efficiency.

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to either have or to hire the engineering talent necessary to determine the safe carrying capacity for the conductors involved.—G. R.

Protection for Barn Feeder

Q. *We are installing an underground feeder line (110/220 1-phase from house to a barn, 100 feet apart, using 3 No. 10 Trench wire U S E, direct burial, and will install a fused disconnect switch in barn, with branch circuit fuse panel adjacent.*

In the house end, is a popular make of range combination panel, 1-"Main" pull-out block and 1-"Range" pull-out block (with range in use) and four plug fuse circuits (all in use) and a 60 amp. "Bus" tap.

The question arises, do we need another fused disconnect switch ahead of the three out-going trench-wire cables or will it be satisfactory to take off the 60 amp. "Bus" tap?

We realize that if a "short" should occur in the underground wiring, it would probably blow the main fuses in range-combination panel thereby throwing everything out.—A.J.G.

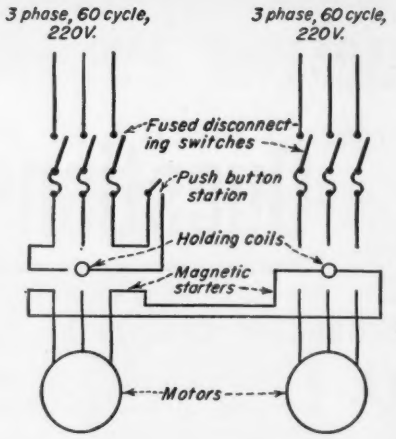
A. It would be permissible to connect this feeder to the barn to the 60 amp. "bus" tap on the service block providing a 30 amp. fuse is provided just after leaving the service block. These 30 amp. fuses are necessary in order to protect the No. 10 wire.

Section 2351, Sub-paragraph "D" requires that such a feeder be equipped with a readily accessible disconnect means within or adjacent to the building.

In the question above the "3 disconnect branch wire cables" are mentioned. This would indicate that the intention is to use single conductor U S E cables. If this be the case, these wires should be kept as close together as possible by either tying them together or twisting them together so that they will remain together after burial, otherwise only a small amount of current might reach the barn.—F.N.M.S.

Motor Interlock

Q. *Accompanying diagram is an installation we have here whereby one motor cannot operate unless another motor is running. The holding coil of the second motor is energized from the load side of the first motor.*



These motors will range anywhere from 1 hp. to 30 hp. The question has come up whether this is according to the National Code and locally no one will venture to say whether it is or is not.

The City Inspector suggested we send you this diagram and you can give us the information as to whether this is according to the National Code or not.—B.R.

A. There is nothing in the National Electrical Code which would prohibit such a kind of interlocking system. Energizing the holding coil of the magnetic starter on the second motor, while it does close the starter, does not energize the motor. The disconnect switch ahead of this second starter would function when it is open to keep the motor from becoming energized.—F.N.M.S.

Number of Outlets in a Circuit

Q. *A new appliance store is being erected here and the electrical contractor insists on placing ten outlets on each circuit. I have advised him that I will refuse to O.K. the job with that many outlets on each circuit as I know many will be supplying much more than 1½ amperes per outlet. There have previously been other disagreements between myself and other contractors here concerning the number of outlets of the duplex convenience outlet type and also the plug-in strip type. Your explanation of this will be appreciated.*—B. B.

A. Stores displaying electrical appliances and devices present a number of rather difficult problems due to the fact that it is practically impossible to determine the loading which may be placed on circuits supplying outlets used for the display of electrical devices. Section 2116 states that where loads on circuits may continue for long periods the minimum unit loads shall

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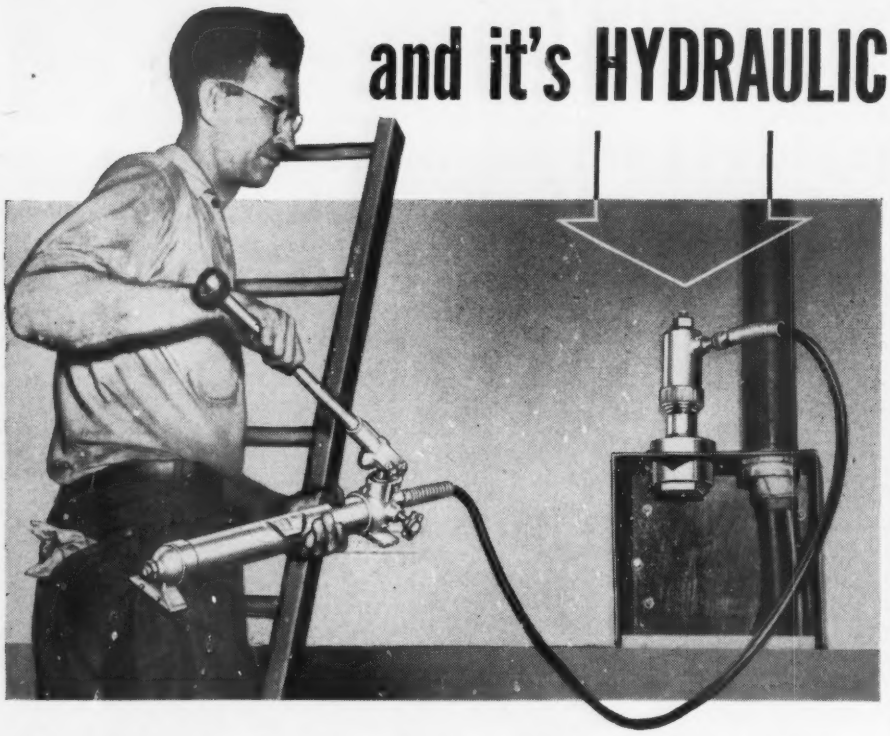

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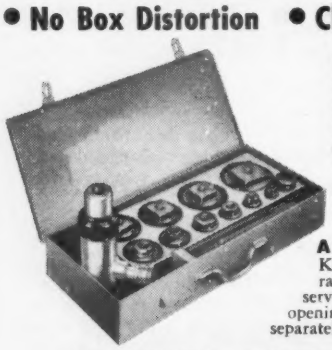

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be increased by 25%. Circuits used to display table or floor lamps or lighting fixtures therefore cannot be considered at 1½ ampere per outlet but must be at least 1.5 plus (1.5x25%) or 1.9 amperes. Where plug-in strips are used, each foot or fraction thereof must be considered as supplying 1.9 amperes. The rule in the Code which accepts five feet of plug-in as an outlet does not contemplate simultaneous use of each outlet on the strip, hence the one foot rule applies in display areas. This will be found under Section 2116 sub-paragraph C-3 of the Code.

An ordinary duplex convenience outlet is considered as a single outlet even though two separate devices may be attached at the same time.

Circuits supplying motor driven appliances on display must be installed as required by Section 4314 and 4316.—G. R.

Non-Metallic Sheathed Cable

Q. *Considerable discussion and interpretations have arisen regarding the use of non-metallic cable in the hollow spaces of cement block buildings.*

In accordance with Section 3362 of the National Electrical Code, such an installation is permitted, if not exposed to excessive moisture. In view of this, would you consider a dwelling above ground-level as complying with the Code? On such installations, we use either non-metallic outlet boxes, or non-metallic cable with a ground wire.

We wish to install lights surrounding a building with a five-foot projection all around. The lights would be installed in the center of the projection (similar to an over-hanging porch roof). We are of the opinion that non-metallic cable could be used in this installation. Are we correct?—C.L.F.

A. The hollow spaces in the outside walls of cement block buildings are generally considered to be exposed to excessive moisture unless the outside of the wall has been treated in some way to exclude moisture. There are preparations on the market which may be used to waterproof such a wall. Where the Inspection Bureau is satisfied that moisture will be excluded from these hollow spaces, they would then be in position to permit non-metallic sheathed cable to be run in such spaces.

Where electric wiring is installed within the space of an overhanging floor or ceiling to supply light in the center of the overhanging projection, such wiring is not subject to moisture.

Of course electric fixtures installed

on the outlets in this location would be subject to moisture and it probably would be advisable to use an outlet box suitable for moist locations in such an installation.—F.N.M.S.

Hazardous Locations

Q. *Is the can filling room in a paint and lacquer factory a Class 1 Division 1 or 2 location? This plant fills cans from tanks located on the floor above and the machines used are of the modern type that both fill and cap the cans, so the amount of open paint or lacquer is small. A test was made with an explosion meter and it showed just a trace of vapor in the air, which indicates it was far below the lower limit of being an explosive mixture. This will make a great difference in the cost of relighting this room, hence there is the desire on the part of the owners to use ordinary lighting equipment. Any ideas you can furnish will be a big help to me.*—T. H. P.

A. The decision to include in the Code provisions for divisions 1 and 2 in my opinion indicates that the Article Committee wanted to provide a loophole for every Code enforcing authority that was having difficulty in requiring the use of Class 1 material. The installation of a recording explosion meter in the most hazardous types of risks indicates that the periods during which vapors are actually within the explosive limits constitute a very small percentage of time. Therefore the use of a direct reading explosion meter within any risk is of no value. In most plants in which highly volatile liquids or flammable gases are used explosive conditions result because of unusual conditions. I therefore believe that a room or area is either hazardous or safe and that they should be wired accordingly. A room or area which might normally be considered hazardous could with proper ventilation be considered safe, provided such ventilating equipment was so designed that its proper operation held in holding coils which would permit use of all ordinary electrical equipment in the otherwise hazardous area. This is my personal belief and is not as yet supported by the Code. We do, however, have a fair size lacquer plant in Minneapolis operating with ordinary electrical equipment in which 12 air changes per hour are assured. The average flash point of the finished lacquers is 35 degrees F, yet in four years of operation no fires or explosions have occurred. I would recommend you consider the can filling room a Class 1 Division 1 location unless they provide an electrically interlocked ventilating system.—G. R.

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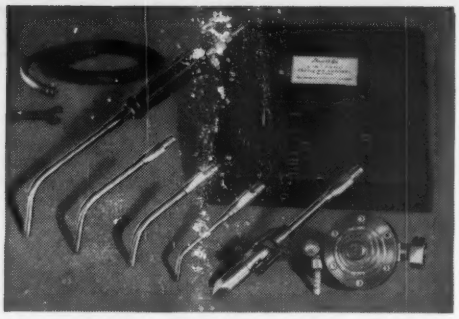

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Official NEC Interpretations

INTERPRETATION No. 332
Issued June 29, 1949

Section 2202
Voltage Drop

QUESTION: Was it the intent of the Electrical Committee that both resistance and reactance drop have consideration in application of section 2202 of the 1947 edition of the National Electrical Code?

ANSWER: Yes. See first note following subcaption "Unit Loads and Feeder Demand Factors" following paragraph a of section 2203 relative to "calculation of load."

INTERPRETATION No. 333
Issued July 11, 1949

Chapter 10
Table 4—Combination of Conductors in Service Runs

QUESTION No. 1: Is it permissible to use the combination 2 #6 type T, and 1 #8 bare copper wires in ¾ inch EMT for main entrance services on small homes?

ANSWER: Yes, but only for service entrance conductors.

QUESTION No. 2: Is it permissible to use the combination of 2-#6 type T, 2-#8 type T and 1-#8 bare copper wires in 1 inch EMT between the outside meter cabinet and the main switch. The extra 2-#8's are for a metered water heater circuit?

ANSWER: Yes.

INTERPRETATION No. 334
Issued July 22, 1949

Bare Heating Wires Buried in Concrete Slabs

STATEMENT: It is proposed to place bare wires of high resistance in the concrete slabs of a sidewalk or driveway connecting them to a current supply so that heating of the buried wires will melt snow and ice.

QUESTION No. 1: Do the provisions of the National Electrical Code recognize supplying this heating circuit at 110-115 volts or higher?

ANSWER: No; possible differences of potential on the surface of the slab may be hazardous to persons or animals, also objectionable stray grounding paths may be established.

QUESTION No. 2: If the heating conductors are supplied at 30 volts through a stepdown transformer, will the safeguarding intent of the National Electrical Code be satisfied?

ANSWER: The direct life hazard may not be present. Stray grounding paths will be possible even at this reduced voltage.

INTERPRETATION No. 335
Issued July 12, 1949

Section 5151-57—Bulk Storage Plant
Section 5156—Storage and Repair Garages for Tank Trucks

QUESTION No. 1: With respect to sections 5151-57 inclusive of the 1947 edition of the National Electrical Code what is included within the term bulk storage plant?

ANSWER: "Bulk Plant" shall mean that portion of a property where flammable liquids are received by tanker, barge, pipe line, tank car, or tank vehicle, and are stored or blended in bulk for the purpose of distributing such liquids by tank vessel, pipe line, tank car, tank vehicle, or container.

QUESTION No. 2: Does section 5156, applying to storage and repair garages for tank trucks call for explosion resisting equipment, compressor motors, controllers, and the like, regardless of elevation above the floor level?

ANSWER: Yes. See paragraph b, in each case of sections 5016 and 5018 of Article 500.

INTERPRETATION No. 336

Issued August 4, 1949

Section 2203—Fixed Appliances

STATEMENT: In a multi-family dwelling nine stories high the vertical riser from the main service contains a feeder from which distribution to each floor is taken from panelboards supplying lighting circuits and appliances for the individual apartments. For calculating the loads supplied by the feeder the following questions relative to the application of paragraph e of section 2203 of the 1947 edition of the NEC were submitted.

QUESTION No. 1: Does the term "fixed appliances" refer to motor-operated appliances such as dishwashers, small air conditioning, garbage disposal, and refrigerator units, the rated load of each exceeding 1½ amperes?

ANSWER: Yes, when four or more appliances are to be installed.

QUESTION No. 2: Does paragraph e permit a demand factor for a sub-feeder to an apartment when the load includes less than four such units?

ANSWER: No.

QUESTION No. 3: May increased demand factors be applied (as in the case of Table 29 for ranges) in calculating the required current-carrying capacity of the feeder in addition to allowances determined in accordance with paragraph e for each sub-feeder or apartment load supplied?

ANSWER: No, the allowances are those determined according to column b of paragraph a of section 2203.

INTERPRETATION No. 337

Issued August 16, 1949

Section 2306

Conductors in Service Raceways

STATEMENT: A "meter loop" on a yard pole includes a service entrance circuit breaker on the load side of the meter and mounted in a suitable enclosure close to the meter. The building served from this yard pole equipment has in addition the service entrance required by Article 230.

QUESTION: Does Section 2306 of the 1947 edition of the NEC forbid running the load side conductors to the top of the pole from the meter at the pole in the same raceway with the line side conductors to the meter–

ANSWER: No.

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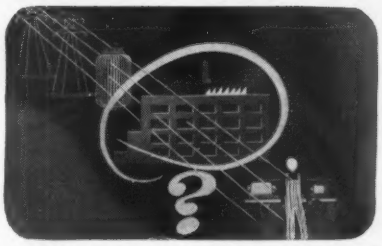

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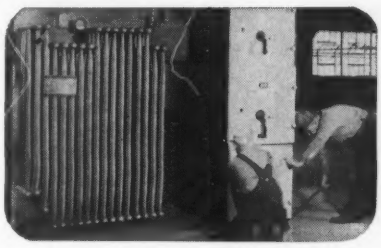

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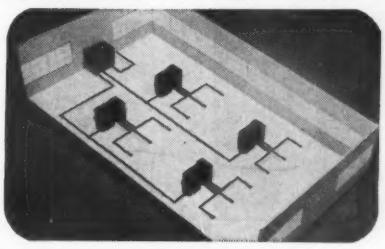

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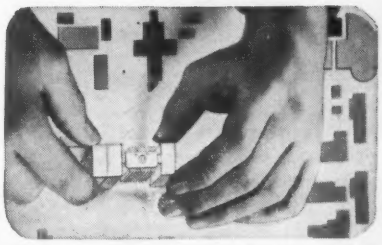

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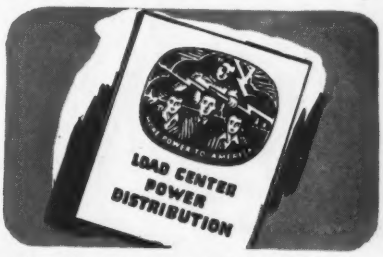

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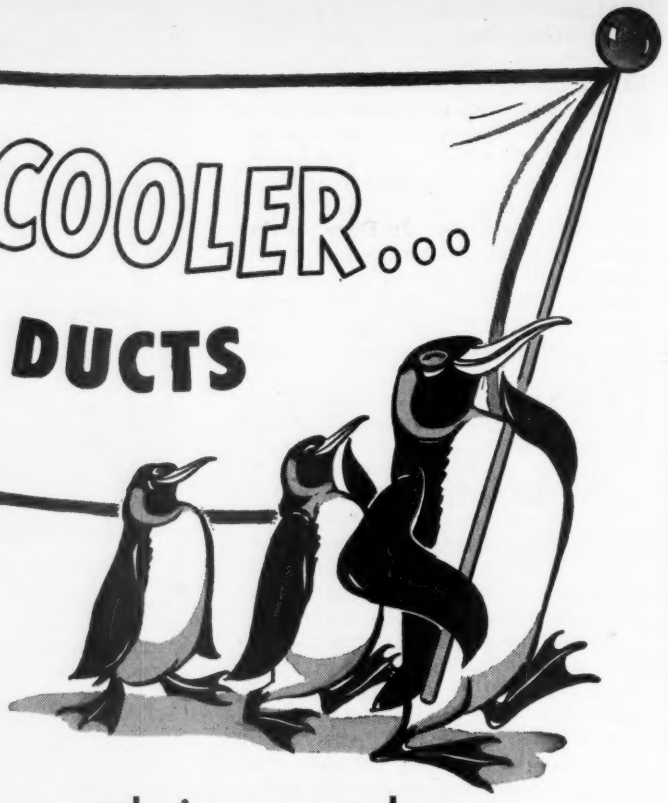

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Temp. Rise from Dielectric loss (C)	1.9	2.1
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Reader's Quiz

Motor for Compressor

QUESTION 330—I have a 5 hp. slipring motor driving an ammonia compressor automatically through a mercoid switch temperature controller, starting dashpot-solenoid and 3-step cutout of the secondary circuit resistor. This motor is overloaded, and I would like to replace it with a 3-phase 7½ hp. wound-rotor induction motor I have available. What practical hookup can I make to start this 7½ hp. motor automatically under load, if possible by using present auxiliary equipment such as temperature controller, dashpot, resistor, etc.?—G.H.

A. TO QUESTION 330—You will have to check the contacts to find out if they can carry the extra load of the 7½ hp. motor. Also, check the resistors to see if they can carry the extra load of the new motor. Some inspectors insist that controls must be stamped with a rating not less than the hp. of the motor. The temperature controller controls the 3 phase magnetic controller and is strong enough to control a 7½ hp. magnetic controller.—H.S.

A. TO QUESTION 330—G. H. states that he has a 5 hp. slip ring motor and desires to replace it with a "wound rotor motor" of 7½ hp.

Since a "wound rotor motor" is usually called a "slip ring motor", I take it that he wishes to replace the 5 hp. slip ring motor with a 7½ hp. slip ring motor.

Normally, a 7½ hp. motor requires a size larger starter than a 5 hp. motor when operated on 220 volts. If operated on 440 volts, the same starter can be used.

If the present 5 hp. motor is not overloaded more than 35%, it might be possible to get by with the same starting equipment as is now being used as the 7½ hp, motor would be operating under a rather light load.

If the 7½ hp. motor is to be run at nearly full load, I would advise installing new starting equipment. However, the temperature control can be used on any automatic starter.

I am under the impression that the slip ring motor is being used because of power company limitations of starting current and if the present 5 hp. equipment is used, the resistors might overheat due to the greater locked rotor current required by the 7½ hp. motor. The motor would not come up to speed as quickly due to extra IR drop through the resistors.

If the present equipment is tried out and if the dashpot is adjustable, I would decrease the time of operation between steps to keep the reisistors in the line a shorter period of time.

If the power company limitations will allow it, the slip rings can be short circuited and the motor thrown directly across the line as are many motors of that size operating compressors. If the slip ring motor is used for speed control, the short circuiting scheme is out.—B.A.S.

Correcting Power Factor

QUESTION 331—We have a 525 hp., 3 phase, 2300 volt synchronous motor, 100% power factor, exciting current 79 amperes, pulling a mechanical load. Recently the machinery which was being pulled by it broke. Our power factor is low. How much power factor can I safely correct with this motor?—M.D.

A. TO QUESTION 331—Like a direct current motor, a synchronous motor develops an internal generated voltage which limits the current through the armature. This voltage is fixed by the excitation, which in turn is reduced by the effect of a leading current which may be taken by the motor. The internal and impressed voltages have a phase difference, fixed by the voltage drop caused by the armature current passing through the synchronous impedance of the armature. The internal voltage lags the impressed voltage under lagging or 100% power factor operation. The lag tends to reduce and may become negative (leading) with increased leading current through the armature. Under strong excitation conditions it is possible for the internal voltage to be greater than the impressed voltage.

With fixed excitation, the armature current varies somewhat in proportion to the load on the motor. At no load, the power taken is sufficient to overcome the copper and core losses, excitation losses, friction and windage losses, etc. With fixed load, the armature current can be varied within sign limits through varying the internal voltage by means of the excitation.

The motor described has an excitation designed to produce unity power factor at full load. If the internal voltage produced by this excitation is less than the impressed (line) voltage, no leading armature current can be developed. If the maximum design internal voltage is the greater, some power factor correction may be obtained, although the results may not justify the expense of running the idle motor.

A test, which assumes constant losses and neglects the effect of armature reaction on the impressed field, will enable a computation. The motor is run idle and the excitation adjusted for minimum armature current (I_o). If the excitation cannot be increased from this point, the test can be dropped and the idea of power factor correction abandoned. The internal voltage has been proved to be less than the impressed voltage. Otherwise, the excitation is increased until it is a maximum. The line current (I_m) is then noted. The component of leading current (I_r) is computed from the equation:

$$I_r = \sqrt{I_m^2 - I_o^2} \qquad (1)$$

The "reactive power" (P_r) contributed by the motor can be computed from the equation:

$$P_r = 1.73 \times I_r V \qquad (2)$$

where LV represents the line voltage of the motor.

The actual power factor correction must be considered on the plant, or a unit of the plant, as a whole and not on an individual circuit basis. If there is a totalizing ammeter or power factor meter, the effect of the motor can be determined by observation. Knowing the system load in watts (W) and the power factor (p.f.), both without

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the addition of the synchronous motor, the resultant power factor can be computed from the equation:

$$\tan \Theta = \frac{W \tan \phi - P_r}{W + 1.73\ VI_o}$$

where ϕ is the phase angle of the plant without the synchronous motor and θ is the resulting phase angle after power factor correction by the motor. The corresponding values of the tangents and cosines (power factor) can be found from trigonometric tables.

Synchronous motors designed for power factor correction, or synchronous condensers, have more generous fields than motors designed to operate at only unity power factor.—L.E.B.

A. TO QUESTION 331—From typical performance of synchronous machines, your motor would produce approximately 260 kvar. of reactive power with the same field current that was in use when the motor delivered its former output of 525 hp. The output as a synchronous condenser can be still further increased safely by increasing the exciting current by 10%. As the power factor of the synchronous machine will be approximately 10%, the a-c current measured at the machine can be considered as leading current and the reactive power available for power factor correction is 1.73 x I x E.—E.E.E.

A. TO QUESTION 331—The limiting factor in using a synchronous motor as a capacitor is in the temperature rise of the machine. When using the motor for this purpose, it will be necessary to over-excite the field. It will be necessary to check with the manufacturer of the machine exactly how much exciting current will be permitted. The load current for the 525 hp. will be practically purely reactive, and you should therefore be able to draw at least 400 kva. reactive power—H.H.S.

Wye-connected Motor

Q *UESTION 332—In a wye-connected 3 phase motor, when one leg of the winding is opened, only one of the two remaining legs will usually burn out. Why? —F. H.*

A. TO QUESTION 332—When one leg of a wye-connected 3 phase motor is open, the effect is to place the other two legs in series across a single phase source of power. When the motor stalls the current in these two legs will increase to a point that the windings will be destroyed unless the motor is protected.

However, as soon as one of the windings opens, the circuit is interrupted so that only one of the two remaining legs will burn out under these conditions. Usually the insulation on the winding of the leg which did not burn out has been damaged so that it is advisable to replace this winding also when the motor is repaired.—J. C. L.

A. TO QUESTION 332—Because, as the load increases on the other two legs, one of the fuses will usually burn out, due to the fact that the fuse rating is not perfectly the same, or the resistance of the winding may not be perfectly the same on each leg. As soon as one fuse burns, and with one winding open, there remains no circuit, so the other leg will be found in good condition. Certain position of your rotor in relation to your phase winding will cause the load factor on the fuse that burns.—E. S. H.

A. TO QUESTION 332—My belief is that when one winding of a Star (Y) connected three phase motor goes open circuit, the next winding in the cycle to receive a voltage null will be the one to suffer breakdown.

In the balanced state, a three phase arrangement receives momentary impulses in phase which cause losses, back e.m.f., reactance factors, etc., to cancel out. If one leg goes open circuit, the next leg to receive a voltage null will provide a ready path for the excess current to take, driven back (as it will be) from the open circuited end and thus away from the remaining possible escape path. Although instantaneous, the normal condition of the circuit will find the voltage in one leg to be at its peak, in another at its lowest ebb and the third at its mean. The magnitude of the current and back e.m.f., produced by the sudden opening of one leg, will be sufficient to heat up and thus weaken one other leg (as above) to such a point that it will rapidly become a natural line of escape and a "ring" (or series of oscillations) will be initiated and will be renewed by each succeeding impulse along the leg in question before it has a chance to decay.

The time required to break down the winding is very short. Once a "ring" of this nature has been impacted, it will carry over a sufficient number of cycles as to completely over-ride any attempt by an identical and adjacent circuit to start in opposition.

This phenomenon is quite common and I believe that it could be seen in this connection if it were possible to observe it, in terms of micro-seconds, by means of an oscilloscope.—W.L.Y.

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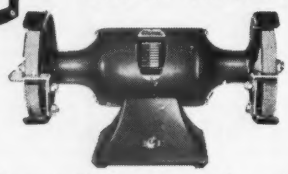

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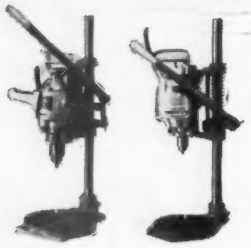

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Motor Problem

QUESTION 333 — On a condenser winding machine there is one motor used which operates at 1800 rpm. normally, at 440 volts and 60 cycles. Now when terminals are to be inserted into the condenser, a mechanical device causes an electrical contactor to remove the 440 volts, 60 cycles from across the motor and then applies 110 volts, 120 cycles to the motor which slows down the motor to a few rpm. How do you account for the 120 cycles producing such slow speed when the poles of the windings are the same under both conditions?—E. J. K.

A. TO QUESTION 333 — The changing from 440 to 110 volts has the effect of reducing the available torque from the motor by the square of the voltages. Then changing from 60 to 120 cycles has the effect of reducing the flux in the machine further. This evidently does not produce enough torque to accelerate the motor to full speed, but instead has just enough torque to turn the shaft slowly under light load.—E. E. E.

A. TO QUESTION 333 — The speed of an induction motor varies directly with the frequency for a given number of poles as shown by the formula

$$\text{E. P. M.} = \frac{120 \times \text{cycles per sec.}}{\text{number of poles}}$$

In E. J. K.'s case, the synchronous speed at 120 cycles would be 3600 rpm. However, for a motor to start or continue to run, *torque* must be developed. This torque depends on the strength of the magnetic field in the stator and the amount of induced current in the rotor, and both of these factors vary with the applied voltage. In an induction motor, this torque varies as the square of the applied voltage.

Consequently, the motor in question, at 110 volts, would have one-quarter normal voltage and therefore one-sixteenth normal torque. This greatly reduced torque is responsible for holding the motor to a few rpm. even though the cycles have been doubled. —H. P. H.

A. TO QUESTION 333 — The voltage of the motor being cut down to ¼ of its rating, in combination with the doubled frequency I believe should produce much less than ¼ of the rated speed. The motor windings will take less amps. with high frequency due to choking effect or inductive reactance. Even though the rotating magnetic field revolves twice as fast with 120 cycles, the amps. do not get through, especially with the low voltage at the same time. This all results in more "slip" between the rotating magnetic field and the rotor. (I suppose it to be polyphase induction motor). Also, the inductive reactance in ohms pulls away at 90 degrees from the resistance in ohms. In this case, the former has the advantage and it pulls the amps. out of step with the volts, or makes very low power factor, and wattless current.—M. C. T.

A. TO QUESTION 333 — The speed of the rotating magnetic field governs the strength of the counter voltage and so will regulate the flow of current through the windings.

When a change of frequency is made, a change in the voltage should be made in the same direction and in the same proportion.

Example: A change from 30 to 60 cycles the magnetic field rotates twice as fast and so the counter voltage is doubled. So if we are to keep the same current value in the stator, the line voltage should also be doubled.—J. McC.

Can you ANSWER these QUESTIONS

QUESTION V15—Could one of your readers give me an example of an inexpensive lightning arrester to be used for television antennas? Is there a way by which one can use a neon light, screw base type, as an arrester? —E.J.K.

QUESTION W15—Can the speed of a d-c motor be changed from 3500 to 1800 by rewinding? The meaning of the question is full load speed at full power without resistors in series. The comparison is to that of rewinding a-c motors to change the poles speed and hp.—L. G. D.

QUESTION X15—Why do some a-c bells use permanent magnets and others do not? What is the effect of a permanent magnet when used in an a-c bell?—R. J. S.

QUESTION Y15—Why are shunts (ammeter) not used on low voltage a-c loads? Also, volt-meters direct, without transformers?—H. H. J.

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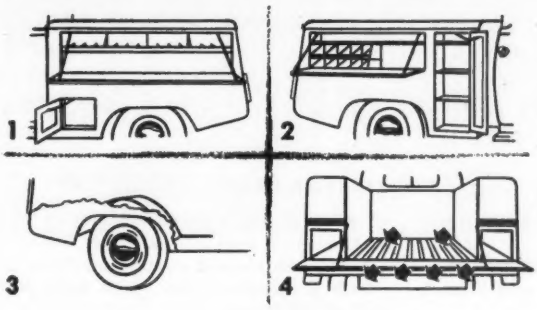

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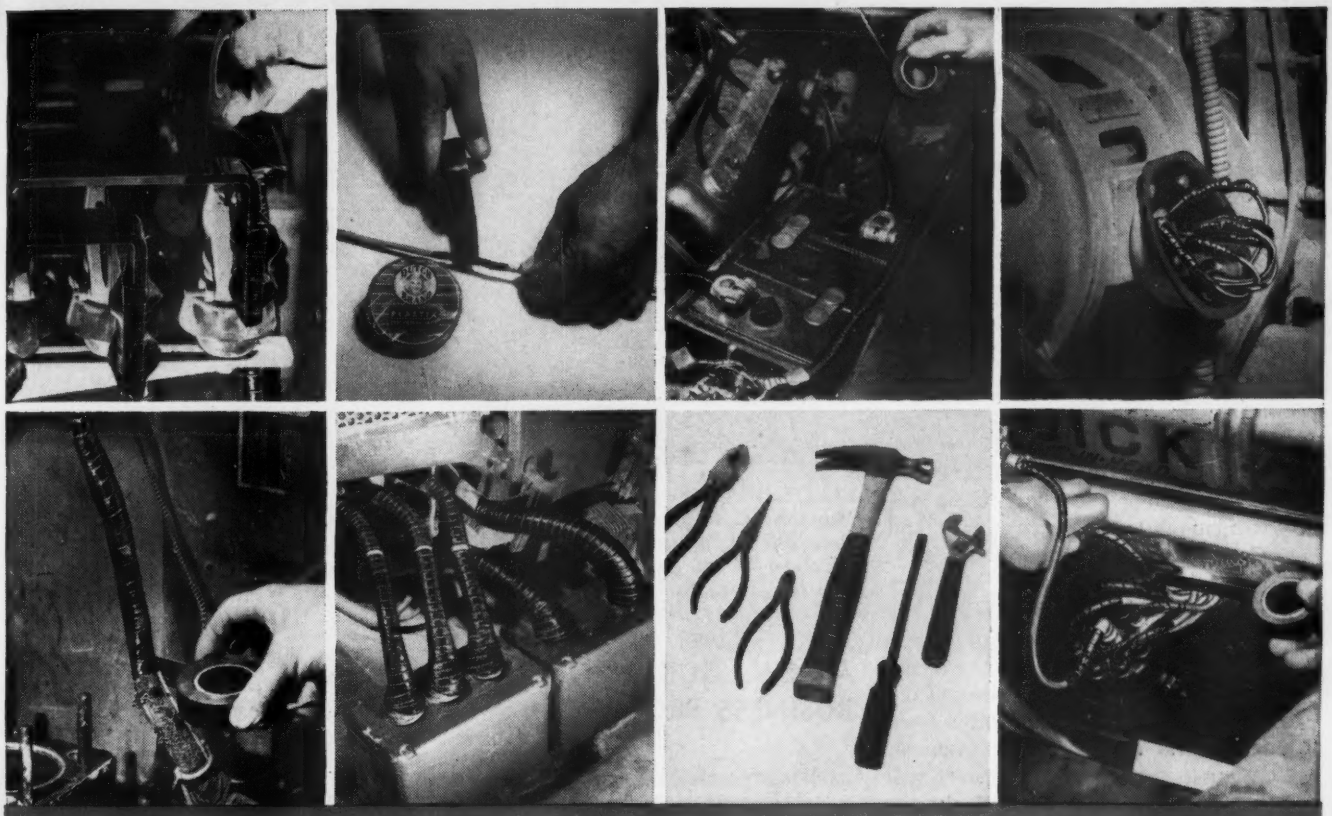

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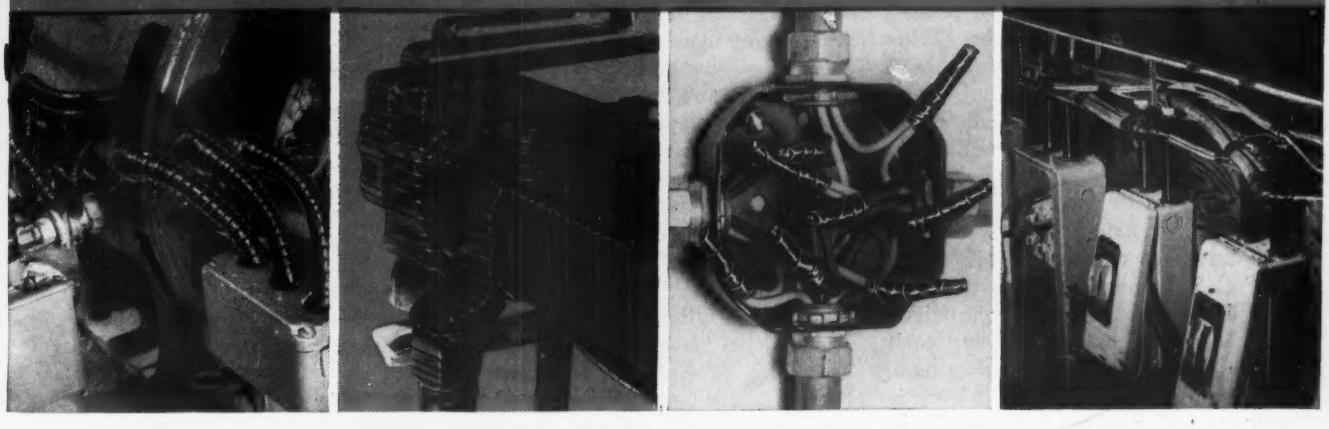

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SIGNALS FOR WET LOCATIONS

[FROM PAGE 47]

on walls which are washed with a hose such as in a dairy, cannery, etc. The lenses may be clear or in color as desired. One or two lamps may be used in the same housing. Metal parts are of brass or iron. Multiple lamp and switch units for mounting on panels and on machinery are also obtainable. One of these is shown in Fig. 4.

Pushbuttons and switches are furnished in various combinations and mounted in watertight cases. Tumbler switches having different circuit requirements have protective flaps and are controlled by external handles.

Clocks which are used in boiler rooms, near swimming pools and similar places require cases which are properly gasketed. On the other hand for outdoor use they must be constructed so as to prevent rain and water from entering and reaching the movement. Continuous unsatisfactory results will be experienced unless these clocks are properly protected.

Intercommunicating wall type telephones when located in damp locations should be enclosed in weatherproof cases and supported so that at least one-half inch of air space is provided between the enclosure and the wall. In wet locations the case should be of watertight construction. Telephones with standard cases should never be installed anywhere but in dry locations since moisture will affect their proper operation and will cause corrosion of parts. Avoid installing them adjacent to windows.

A terminal strip box of watertight and dust-tight construction is shown in Fig. 5. Standard sizes range from 5 to 180 terminals and are provided with a marker strip for coding each circuit. Enclosures are of aluminum, brass or iron. The hinged cover is equipped with a gasket and is held tight with heavy brass hinged bolts and wing nuts.

Junction, pull, floor and fuse boxes may also be supplied of watertight construction in aluminum, brass or iron and equipped with screw type covers complete with rubber gaskets.

While in some instances it may become necessary to install signal control equipment in watertight cases, and locate them in wet places, it is recommended that wherever possible they be placed in cool dry rooms. In this way it will be assured of securing frequent attention and supervision at regular intervals.

ELECTRICAL CONTRACTOR ***G. B. Muench (right), Louisville, Ky., takes time out at Western Section I.A.E.I. conclave in St. Louis to gather some lighting data from L. J. Rozier, Day-Brite Lighting, Inc., St. Louis.***

A NEW LOOK INTO YOUR BUSINESS PROGRESS

[FROM PAGE 42]

particular time. Figure 2 represents such a job Man-Power Schedule.

To determine the number of *Incomplete Man-Hours of Work to Date* (appearing on line 2 of the Weekly Man-Hour Control Report), it is necessary to maintain a "MONTHLY PROGRESS REPORT" such as is shown in Figure 3. This also provides an excellent barometer of the progress that is being made on each specific job. Should any situation appear to be getting out of hand, the condition can be immediately spotted and appropriate action taken.

The Superintendent should also be kept posted as to the progress being made toward realizing the Man-Hour Quota for Fiscal Year. To accomplish this, a "WEEKLY MAN-HOUR REPORT" (shown in Fig. 4) is completed and distributed each pay day. This presents, at a glance, the complete man-hour picture as of that date and compares it with the established yearly bogie.

All of these means are taken to steer the ship of business on the proper course. If the total budgeted man-hours are realized through work secured, and the proper application of Labor Burden placed thereon, then only would it be possible for improper estimating of man-hours to prevent the successful operation of business for a period of time.

The most certain basis upon which ultimate success and prosperity must be established is the successful operation of a business from day to day and from week to week.

NECA CONVENTION REPORT

[FROM PAGE 39]

that the American people believe in the importance of the Administration's four-point program involving foreign trade and called on business to give it whole-hearted support. The program involves the point-four program for development of economic underprivileged parts of the world, international trade organization, the reciprocal trade agreement program and lowering of tariffs, and the European Recovery Program.

Dan Tracy, International President of the International Brotherhood of Electrical Workers, Washington, D. C., in his address before the convention said "In the history of labor relations between NECA members and IBEW, the success of collective bargaining has been justifiably recorded. For more than a quarter of a century unsettled strikes for wages or working conditions have been non-existent.

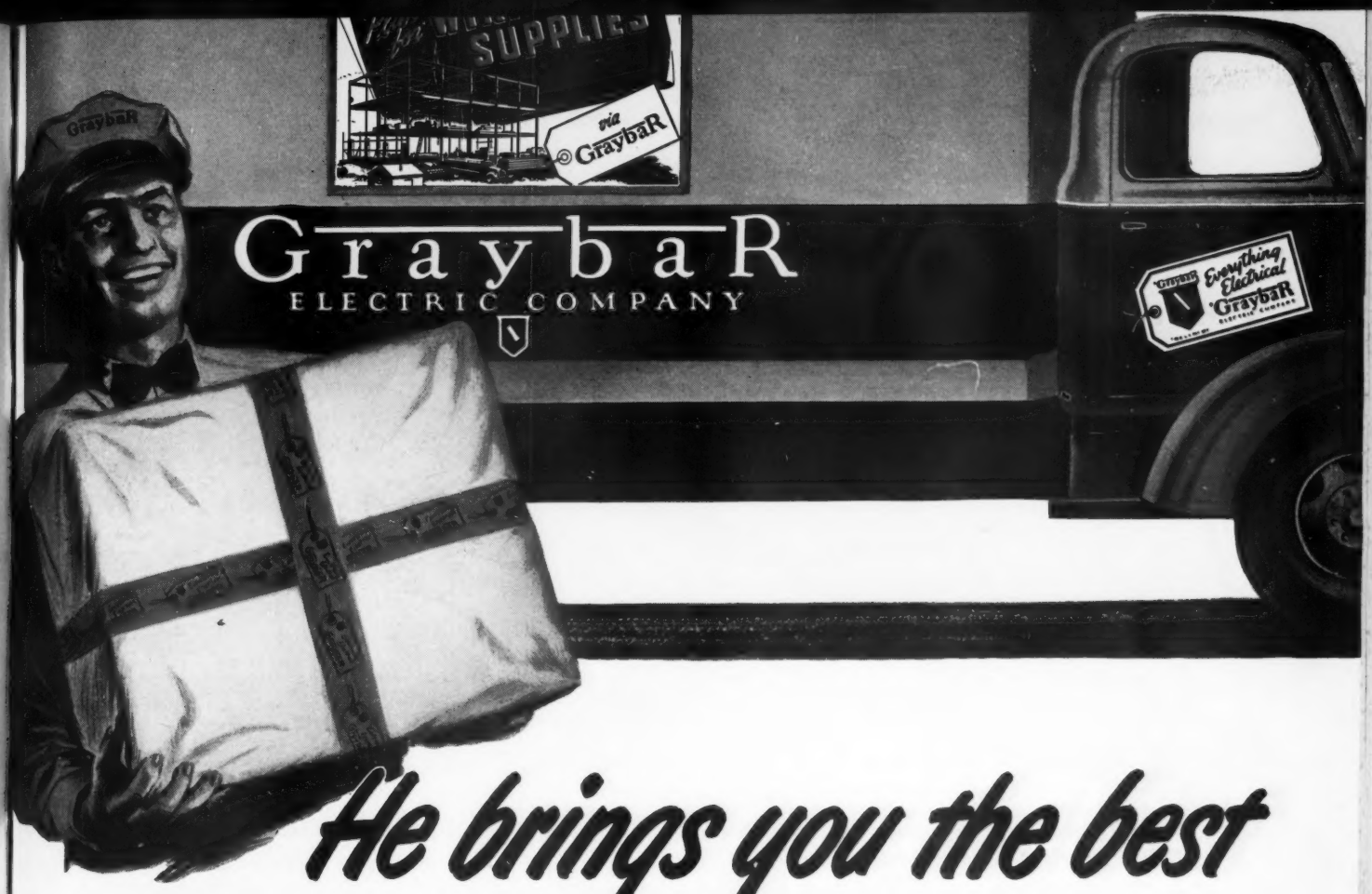
"Another of the numerous beneficial results of collective bargaining within our industry is the progress to date in the matter of collateral provision of pension benefit funds," he said. "There are some who believe that pensions should be provided from the profits of the employer. Others feel that pension funds should be sustained by the employer and the employee jointly. Still others contend that the employee should receive an increased wage enabling him to protect himself against future insecurity. Finally, there are those who profess conviction that the government should provide sufficient pensions through augmentation of the present social security program.

"It is imperative to keep in mind, however, that regardless of which of these methods are relied upon or resorted to, the fact remains that industry must of necessity be the originating source."

Mr. Tracy continued, "Let none be so venturesome as to view pensions as a passing fad or an escapable nuisance. Pensions as a proper compensation are here to stay."

Norman W. Fitzler of St. Louis, Mo., received the NECA National Apprenticeship Award at the banquet. The award was presented by E. H. Herzberg, chairman of the NECA Apprenticeship Committee and chairman of the National Joint Committee on Apprenticeship and Training for the electrical industry.

It was announced that the convention next year will be held in October at Los Angeles, Calif.



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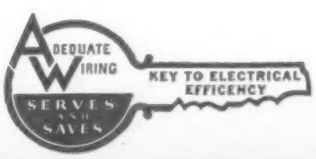

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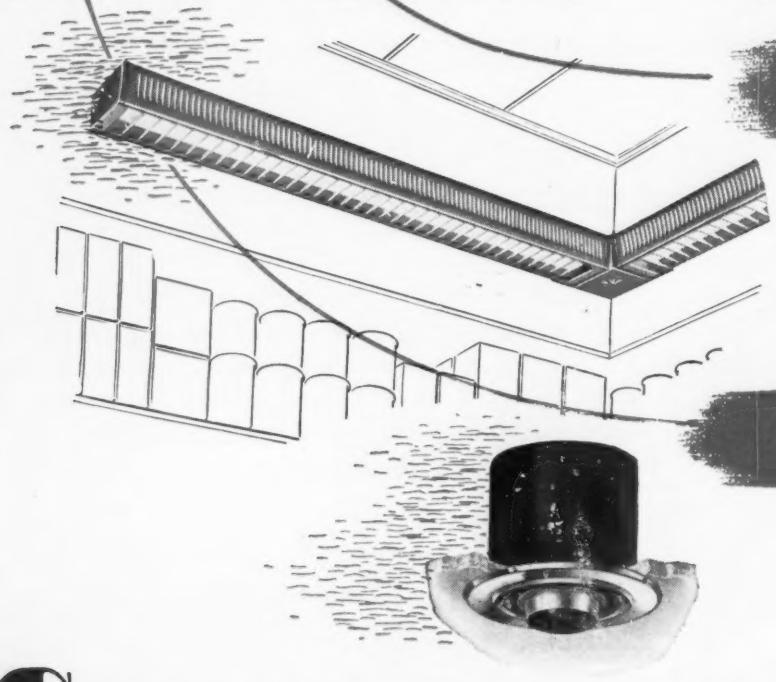

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CURTIS "Punchy"

CATALOG No. 2240

A small, highly practical downlight, utilizing one side-prong PAR-38, 150-watt projector flood or spot lamp. Lamp can be adjusted, from the floor, to any angle 0° to 35° from vertical and 0° to 360° horizontal. Provides punch lighting for counters, show cases, mannequins, and other areas where "Attraction Zone" lighting will give maximum sales appeal to merchandise.

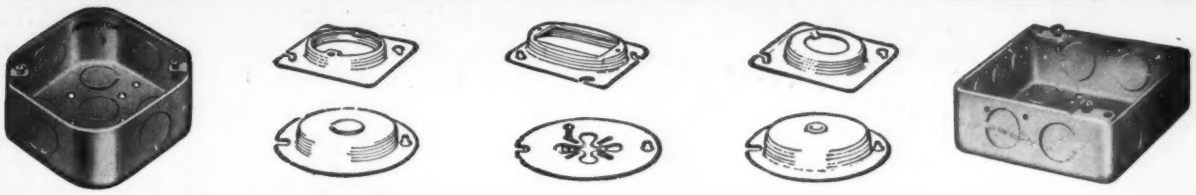
CURTIS LIGHTING, INC.
6135 WEST 65th STREET, CHICAGO 38, ILLINOIS
CHICAGO . . TORONTO . . NEW YORK

. . . the best of everything electrical

Complete APPLETON Line

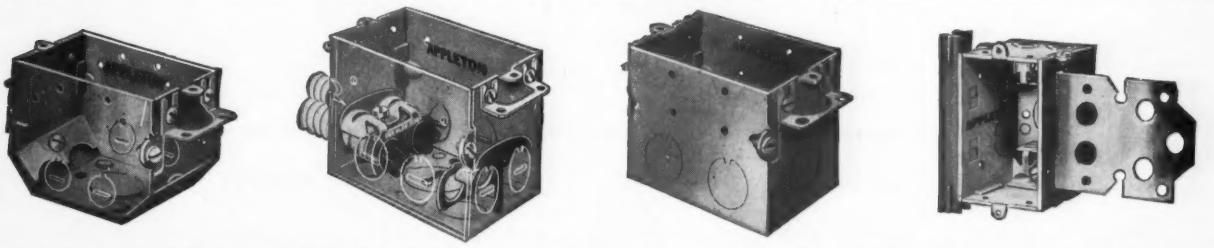
Solves 15,000 wiring problems

OR EXAMPLE



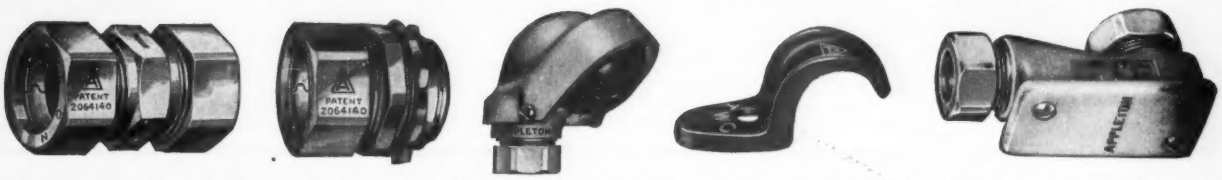
3¼ AND 4 INCH OCTAGONAL BOXES—4 AND 4 11/16 INCH SQUARE BOXES—WIDE SELECTION OF COVERS

OR EXAMPLE



SWITCH BOXES, VARIOUS DEPTHS, WITH OR WITHOUT CLAMPS AND BRACKETS

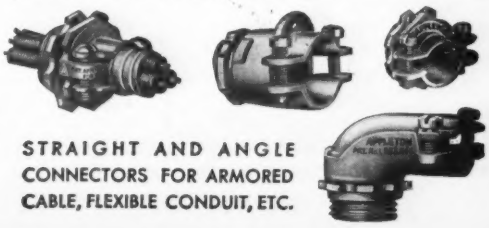
OR EXAMPLE



COUPLINGS AND CONNECTORS, ENTRANCE FITTINGS, CLAMPS, ETC. FOR ELECTRICAL METALLIC TUBING

OR EXAMPLE

COUPLINGS, CONNECTORS, CLAMPS AND ENTRANCE FITTINGS FOR RIGID CONDUIT.



STRAIGHT AND ANGLE CONNECTORS FOR ARMORED CABLE, FLEXIBLE CONDUIT, ETC.

"Standard for Better Wiring"

Write for Catalog Information

Completeness of the Appleton Line is outstanding . . . just as expert design and precision manufacture are outstanding qualities of all the more than 15,000 items Appleton makes.

The products illustrated above are examples—products from Appleton's own foundries and fabricating plants, skilfully designed by Appleton engineers, and recognized throughout the electrical industry as "STANDARD FOR BETTER WIRING."

In the COMPLETE APPLETON LINE is every fitting required for every job. That means selection is simplified . . . work goes more smoothly because the correct fitting for every turn and terminal is ready when you want it. Have the backing of the complete Appleton line, of superior Appleton design, and sturdy, dependable Appleton quality. Specify Appleton fittings for every job.

SOLD THROUGH ELECTRICAL WHOLESALERS

APPLETON ELECTRIC COMPANY

1704 WELLINGTON AVENUE • CHICAGO 13, ILLINOIS

Branch Offices: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Minna St. • ST. LOUIS, 420 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Avenue • ATLANTA, 724 Boulevard, N.E. • BIRMINGHAM, 429 Brown-Marx Bldg. • MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 East Pleasant St. • BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 1017 Cherry Street • CINCINNATI, 626 Broadway • HOUSTON, 738 M. & M. Bldg.

Resident Representatives:
Dallas, Indianapolis, Jacksonville, Kansas City, Milwaukee, Seattle

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International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

CONDUIT FITTINGS • REELITES
LIGHTING EQUIPMENT

APPLETON

OUTLET AND SWITCH BOXES
EXPLOSION-PROOF FITTINGS

The best of everything electrical . . . via GraybaR

GUIDE
to modern factory lighting practice

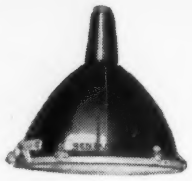
for general lighting

"TURNLOX" RLM DOME REFLECTORS

for lighting from the side

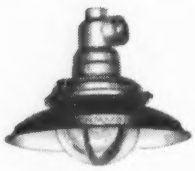
ELLIPTICAL ANGLE

for high bay lighting



"STEELITE"

for explosive atmospheres

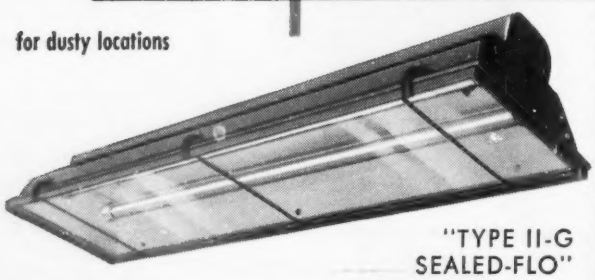


EXPLOSION-PROOF

for damp and wet locations

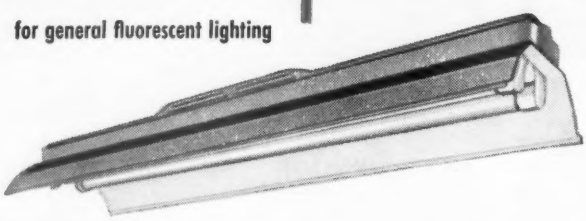
VAPOR-TIGHT

for dusty locations



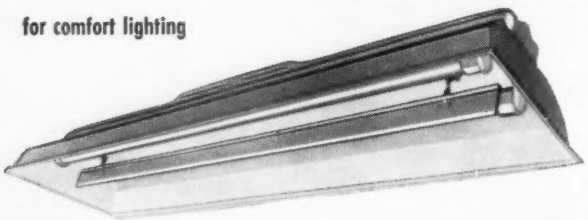
"TYPE II-G SEALED-FLO"

for general fluorescent lighting



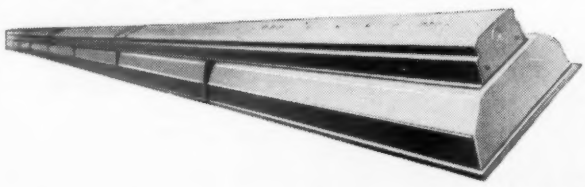
"TWIN-FLO"

for comfort lighting



"SHIELD-FLO"

for high level lighting



"LITE-LINE"

for extra high level lighting

"MAGNA-FLO"

Benjamin Electric Mfg. Co.
Dept. H
Des Plaines, Illinois

Please send me without cost or obligation Data Bulletins on:

- ☐ "TURNLOX" RLM DOME REFLECTORS
- ☐ ELLIPTICAL ANGLE
- ☐ "STEELITE"
- ☐ EXPLOSION-PROOF
- ☐ VAPOR-TIGHT
- ☐ "TYPE II-G SEALED-FLO"
- ☐ "SHIELD-FLO"
- ☐ "LITE-LINE"
- ☐ "TWIN-FLO"
- ☐ "REX-LITE"

NAME_____

POSITION_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE_____ STATE_____

R-3236EC

Modern Factory Lighting Practice begins with the Seeing Task . . . with the things that the employee does and the factors which directly and indirectly affect his ability to see.

To fit the lighting to the Seeing Task involved in a specific operation or operations, requires first of all the selection of the proper *type* and *make* of lighting units. These units must be designed so as to provide, satisfactorily and economically, the kind of illumination required by this Seeing Task. Further, the lighting units should meet the special environmental conditions of the location, being so designed as to facilitate maintenance, promote safety and reduce operating costs to a minimum.

The chart above illustrates how some of the most commonly encountered lighting problems can be solved through the specification of Benjamin Lighting Units. Data Bulletins are available on each and may be obtained without cost or obligation from your Electrical Contractor, or by sending the coupon to Benjamin Electric Mfg. Co., Des Plaines, Illinois.

BENJAMIN
Lighting Equipment
Distributed Exclusively through Electrical Wholesalers

. . . the best of everything electrical

PUSH... and electrical service is restored with BullDog *Pushmatic*

THAT'S ALL there is to it! A simple push of the finger makes or breaks the circuit. No resetting manually when the circuit is broken by short or overload. Just PUSH —and service is restored.

Pushmatic is compact, sturdy, simple . . . the most versatile and flexible unit available today. It will meet every new or changing load condition.

And *Pushmatic* units are easy to install! There are no complicated group mountings . . . individual single-pole units make additions and changes a simple matter.

There are four types of *Pushmatics:* THERMAL ONLY, THERMAL-MAGNETIC, or either of these types with AMBIENT COMPENSATING FEATURES. All are identical in size and contour, in ratings of 15, 20, 30, 40, and 50 amperes, 120 V., 1 pole, or 120-240 V., 2 poles, AC. All are interchangeable for rating and type.

Write today for *Pushmatic* Bulletin #493. This descriptive bulletin contains complete information and prices on BullDog Electri-Centers and the new *Pushmatic.*

Only *Pushmatic* Electri-Centers provide push-button control, automatic protection!

REVOLUTIONARY, new *Pushmatic* ELECTRI-CENTERS provide electrical control centers that are the last word in efficiency and protection.

They are attractive, compact, simple . . . easy to wire. There's plenty of gutter room even in the smallest cabinets.

With Electri-Centers there are no fuses to buy, no complicated operations or installation techniques to remember. You get versatility and adaptability, ease of installation and operation *never before obtainable in any panelboard.*

See the new ELECTRI-CENTERS at first opportunity, or write today for *Pushmatic* Bulletin #493.

BULLDOG ELECTRIC PRODUCTS COMPANY

DETROIT 32, MICHIGAN — FIELD OFFICES IN ALL PRINCIPAL CITIES

IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO

BULL DOG

HEADQUARTERS FOR ELECTRICAL DISTRIBUTION

The best of everything electrical . . . via GraybaR

"We Reduced Costly and Troublesome Shutdowns Due To Needless Blows On A Circuit Serving 3 Arc Welders"

When We Installed"

"In the Truck Service Garage in Casper, we have the job of servicing three 220 volt arc welders connected to a 60 ampere switch. Frequently all these welders are thrown on the line at the same time.

"This causes a heavy rush of current that generally blew the 60 ampere renewable fuses we formerly used to protect the circuit.

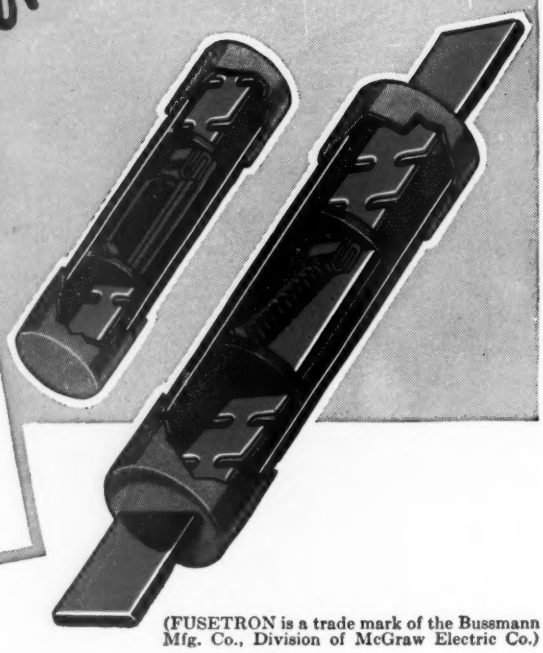
"The resulting shutdowns were very costly to our customer and troublesome to us.

"During 1947 we decided to see if Fusetron dual-element fuses would help cure the trouble and so installed three 60 ampere ones in the switch.

"That was many months ago but so far not one Fusetron fuse has blown on the starting current of the welders.

"You can take it from us Fusetron dual-element fuses really do eliminate needless shutdowns."

Geo. Forster, President
FORSTER ELECTRIC COMPANY,
Casper, Wyoming



(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

Facts About FUSETRON Dual-Element FUSES

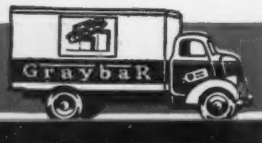
The fuse link element opens on short-circuit — the thermal cutout element protects on overloads — the result, a fuse with tremendous time-lag and much less electrical resistance.

They have the same degree of Underwriters' Laboratories approval for both motor-running and circuit protection as the most expensive devices made.

Made to the same dimensions as ordinary fuses — fit all standard fuse holders.

Obtainable in all sizes from 1/10 to 600 ampere, both 250 and 600 volt types. Also in plug types for 125 volt circuits.

Their cost is surprisingly low.



...the best of everything electrical

Fusetron DUAL ELEMENT Fuses

with their

10 Point Protection

1. Protect against short-circuits.
2. Protect against needless blows caused by harmless overloads.
3. Protect against needless blows caused by excessive heating — lesser resistance results in much cooler operation.
4. Provide thermal protection — for panels and switches against damage from heating due to poor contact.
5. Protect motors against burnout from overloading.
6. Protect motors against burnout due to single phasing.
7. Give DOUBLE burnout protection to large motors — without extra cost.
8. Make protection of small motors simple and inexpensive.
9. Protect against waste of space and money — permit use of proper size switches and panels.
10. Protect coils, transformers and solenoids against burnout.

STOP *Wasting Time and Money —*

FUSETRON
TRUSTWORTHY NAMES IN ELECTRICAL PROTECTION
BUSS

FUSETRON Dual-Element Fuses Give ALL-PURPOSE PROTECTION

One needless shutdown — or one lost motor — or one destroyed switch or panel — may cost you far more than replacing every ordinary fuse with a FUSETRON dual-element fuse.

Don't risk such losses — protect yourself by installing a FUSETRON dual-element fuse in every set of fuse clips throughout the entire electrical system.

(FUSETRON is a trade mark of the Bussmann Mfg. Co., Division of McGraw Electric Co.)

Bussmann Mfg. Co., University at Jefferson
St. Louis 7, Mo. (Division McGraw Electric Co.)

Please send me complete facts about FUSETRON dual-element Fuses.

*Name*_____

*Title*_____

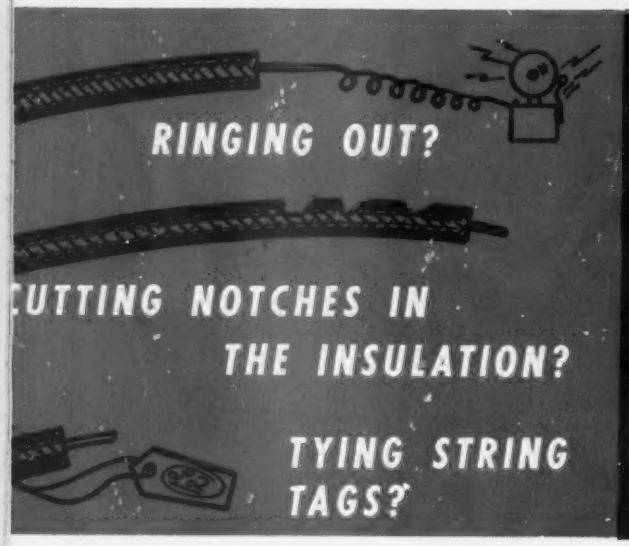
*Company*_____

*Address*_____

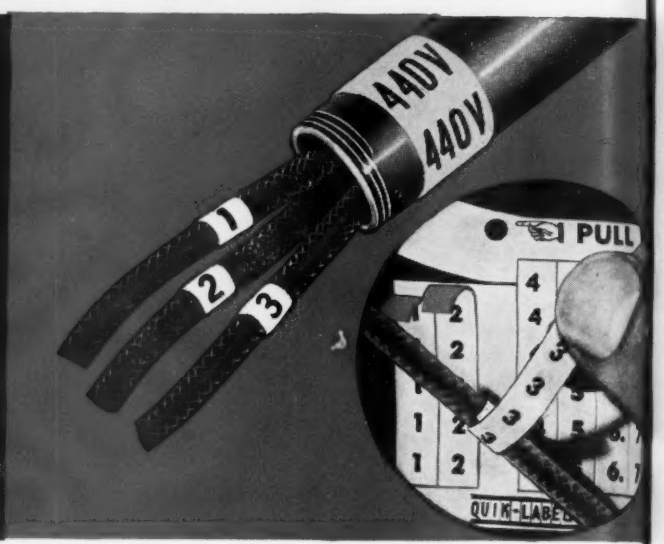
*City & Zone*_____ *State*_____ EC&M 12-49

The best of everything electrical . . . *via* GraybaR

How do you mark your wires

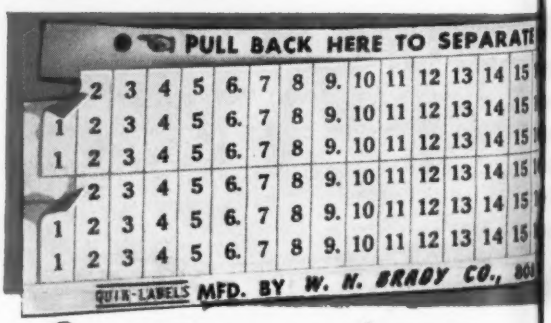


OR



Compare QUIK-LABELS with *all* other Wire Marking Methods

	Brady QUIK-LABELS	Notches Cut in the Insulation	String Tags Tied on Wires	Metal Tags (Not Illustrated)
SELF-ADHESIVE	Yes	No	No	No
STAY ON WIRES WHEN PULLED THRU CONDUIT	Yes	Yes	No	No
ALL NEMA CODES AND SYMBOLS IN STOCK	Yes	No	No	No
READY TO USE — PERMANENT	Yes	No	No	Yes
LEGIBILITY	Excellent	Poor	Fair	Poor
COST TO BUY	8 for 1c to 2 for 1c	Varies with Amount of Wire Wasted	10 for 1c to 1 for 1c	7 for 1c to 2c each
COST TO APPLY (At $2.00 per hour)	½c per label (maximum)	1c per notch	3c per tag	2c per tag



Save Time *and* Dollars

All Stock QUIK-LABELS are 1½" long for wires up to .500" O. D. We can cut them in half to make two rows of ¾" long labels as shown. This gives you *twice* as many labels on each card. *There is no charge for this service.* ¾" QUIK-LABELS mark all wires under .210" O. D. Ideal for flagging smaller wires too. Make Brady QUIK-LABELS your *Standard Wire Marking System.* Simplify buying and storing. Eliminate costly, obsolete methods. Brady ships same day from OVER 1,000 *DIFFERENT* QUIK-LABELS IN STOCK.

PIPE MARKERS

QUIK-LABEL Pipe Markers conform to Am. Stds. Assn. Pipe Identification System. Large letters on correct ASA background colors CAN BE READ UP TO 75 FEET. Stick without moistening. Write for Bulletin No. 135.

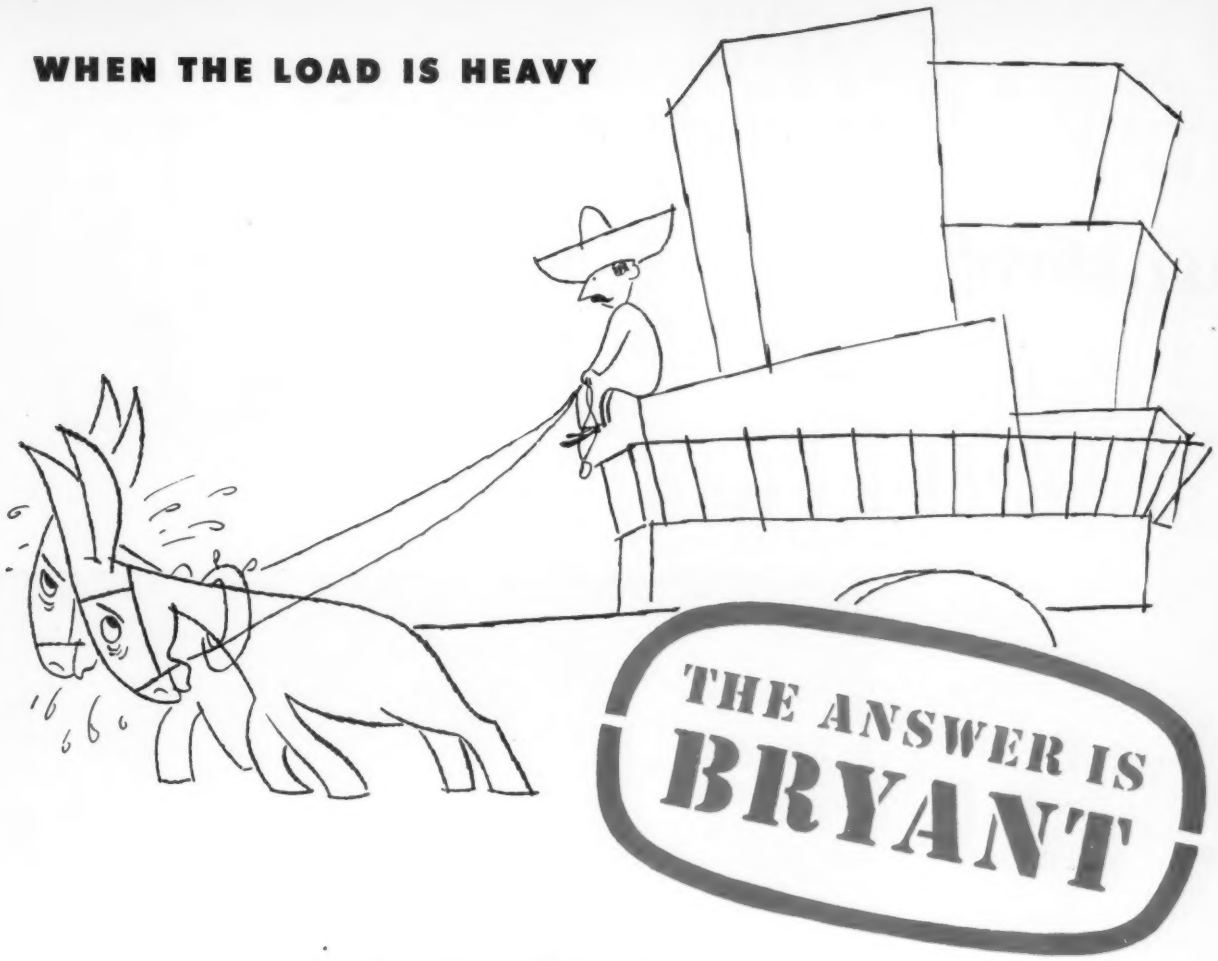
W. H. BRADY CO.

Manufacturers of Wire Markers and Other Self-sticking Tape Products

246 West Wells St., Milwaukee 3, Wis.

...the best of everything electrical

WHEN THE LOAD IS HEAVY



WITH BRYANT 5861 LINE OF 20 AMPERE FLUSH SWITCHES

These heavy duty switches are built for service in commercial, institutional and industrial installations where more severe loads are encountered.

Shallow cup, 1 15/32" deep, permits installation in conventional switch boxes.

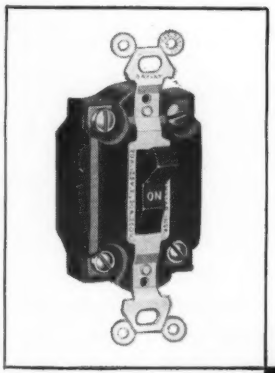
The mechanism is equipped with snuffers and is entirely enclosed in a rugged bakelite housing.

The washer type plaster ear yoke is insulated from the mechanism. Large, well-recessed binding screws permit easy wiring.

Available in single pole, double pole and three-way types with brown and ivory handles. Lock and momentary contact features can be furnished.

Meets all specifications.

Listed as standard by Underwriters' Laboratories, Inc.



J-99835

BRYANT
SUPERIOR WIRING DEVICES

THE BRYANT ELECTRIC COMPANY

Bridgeport 2, Connecticut

CHICAGO • LOS ANGELES

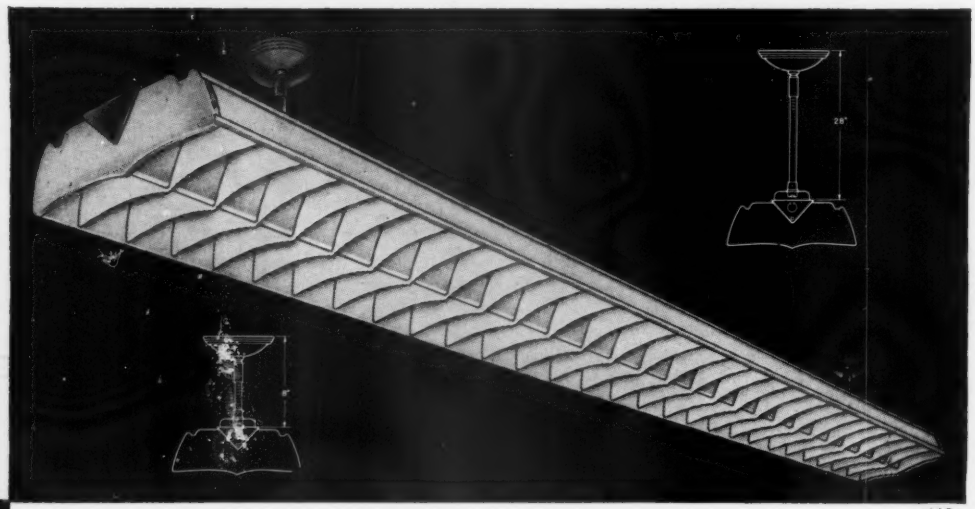
SPECIFY BRYANT DEVICES FROM YOUR ELECTRICAL WHOLESALER

The best of everything electrical . . . via GraybaR

NOW!

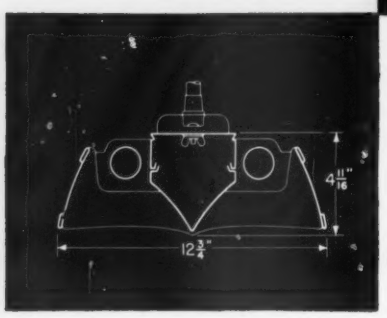
DAY-BRITE'S LUVEX

NEW!



469

For two 96" T-12 Slimline lamps, single unit or continuous installations. For suspension mounting, listed with 8" and 28" "A-J" Adjustable hangers.



"DECIDEDLY BETTER" SLIMLINE

Once in a blue moon, a truly great fixture makes its appearance. Now, after years of research and designing, the matchless new Day-Brite "LUVEX" is ready.

All the usual advantages of Slimline, of course — instant starting . . . extremely high efficiency.

But then, add these "LUVEX" extras—sturdy, *no-sag,* heavy gauge steel chassis, *enclosure and louvers completely interlocked into a rigid one-piece unit,* quick, easy installation and smart appearance—and the "LUVEX" is absolutely *everything* you expect of Slimline lighting.

Maintenance? *Simple!* So simple, in fact, that the "LUVEX" can be relamped and cleaned without disturbing a single part of the fixture—without so much as touching a latch, chain, nut or bolt!

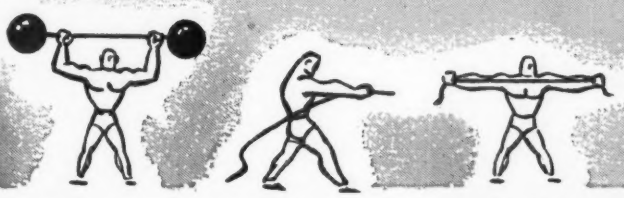
Get the full "LUVEX" story. It will pay you to know all the facts about this remarkable new Day-Brite development. Write today for Bulletin 10-M.

IT'S EASY TO SEE WHEN IT'S
DAY-BRITE *Lighting*

Day-Brite Lighting, Inc., 5402 Bulwer Ave., St. Louis 7, Mo.
In Canada: Amalgamated Elec. Corp., Ltd., Toronto 6, Ontario

. . . the best of everything electrical

WHEN TIME IS MONEY . . . use COFFING HOISTS



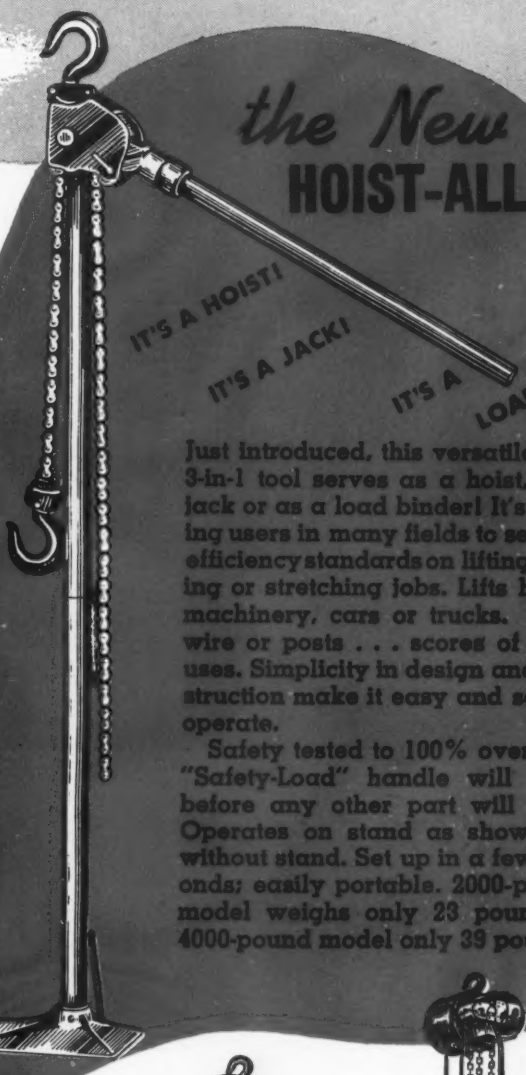
TO LIFT . . . TO PULL . . . TO STRETCH

Inadequate hoisting equipment overcharges you on the time sheet. With an efficient, easy-to-use and safe Coffing Hoist on the job you'll find yourself ahead time and again, in money and manpower. Check the complete Coffing line for the hoist you need.

the New "MIGHTY-MIDGET" PULLER

A mite for size but mighty in power is this new 6½ lb. puller that has a rated capacity of *500 pounds!* Maintenance and construction men like it because it's *light*, yet versatile enough to handle scores of lifting or pulling jobs . . . plus pulling wire and raising cable.

Two-way handle serves as a lever or high speed crank. Tested to 50% over capacity; equipped with "safety-load" handle that will bend before any other part of the puller will give.



the New HOIST-ALL

IT'S A HOIST! IT'S A JACK! IT'S A LOAD BINDER!

Just introduced, this versatile new 3-in-1 tool serves as a hoist, as a jack or as a load binder! It's helping users in many fields to set new efficiency standards on lifting, pulling or stretching jobs. Lifts heavy machinery, cars or trucks. Pulls wire or posts . . . scores of other uses. Simplicity in design and construction make it easy and safe to operate.

Safety tested to 100% overload. "Safety-Load" handle will bend before any other part will give. Operates on stand as shown, or without stand. Set up in a few seconds; easily portable. 2000-pound model weighs only 23 pounds—4000-pound model only 39 pounds.

"SAFETY-PULL" RATCHET LEVER HOISTS

The all-purpose hoists for every lifting job. Single or double locking pawl construction. Load is always under control. "Safety-load" handle of malleable iron will bend before any other part of hoist gives. Every model tested to 100% overload. Nine models available with capacities ranging from ¾ to 15 tons. Standard lift 5 feet; chain may be added for longer lift if required.

SPUR GEARED CHAIN HOISTS

Both top and load hooks are drop forged, heat-treated steel. Extra heavy malleable iron crosshead permits rocking motion of hoist; heavy suspension plates provide support between top hook crosshead and load sheave. Automatic load brake holds load securely at any desired position. Available in seven models to handle from ½ to 5 tons.

"QUIK-LIFT" ELECTRIC HOISTS

Uses only a few cents worth of AC or DC current per day. Each model equipped with heavy duty motor, single or three phase. High starting torque. Pendant rope control gives lifting or lowering accuracy to the fraction of an inch. Large braking surface. Top and bottom hooks of drop forged alloy steel. Load chain is of high grade steel, electric welded, factory tested. Hook or lug suspension. Available in 17 models to handle from 500 to 4000 pounds at lifting speeds most suitable for your requirements.

THE COMPLETE COFFING LINE ALSO INCLUDES

DIFFERENTIAL CHAIN HOISTS • I-BEAM TROLLEYS
UTILITY MAINTENANCE TOOLS

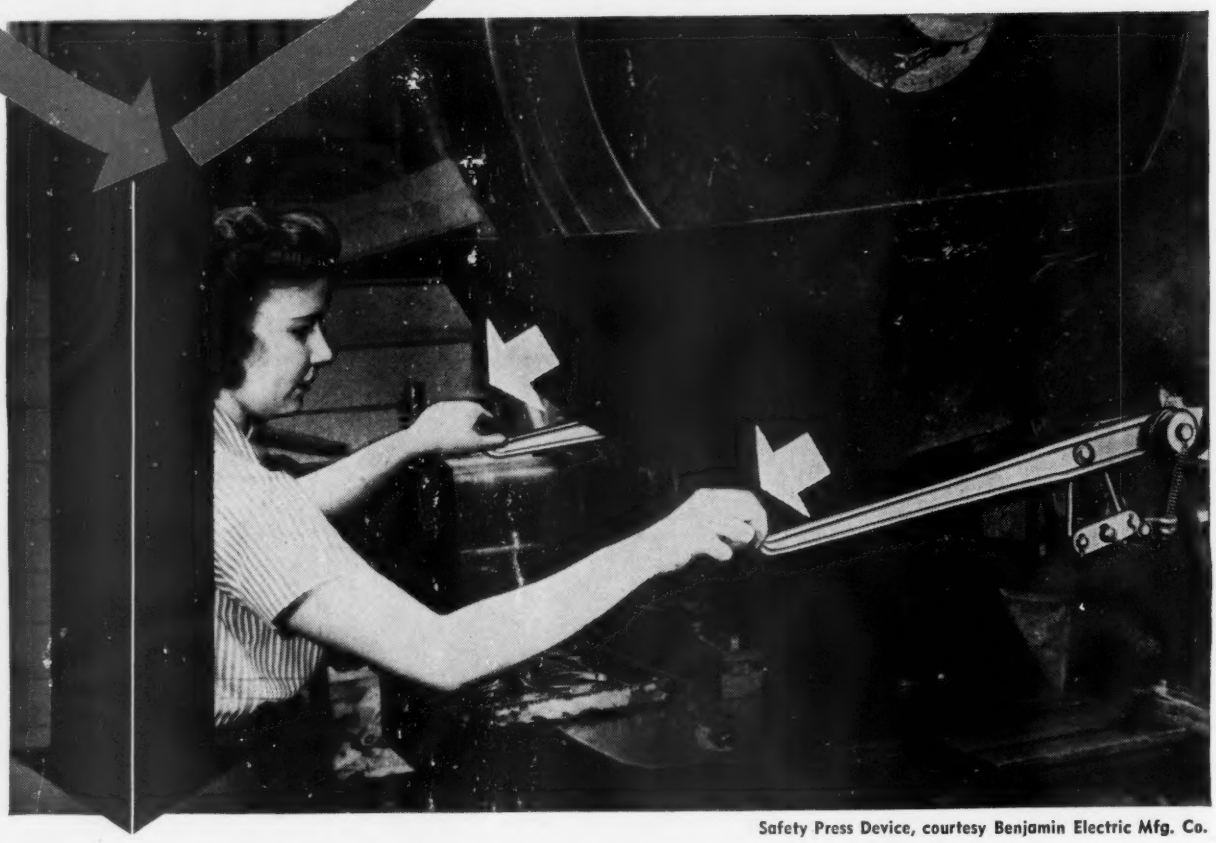
Illustrated bulletins available for these as well as all Coffing Hoists pictured on this page. Write:

COFFING HOIST COMPANY

DANVILLE • ILLINOIS

The best of everything electrical . . . via GraybaR

It **PAYS** to have **"De-Lays"!**



Safety Press Device, courtesy Benjamin Electric Mfg. Co.

"De-Lays" that prevent *production tie-ups*

Modern ECONOMY "De-Lay" Fuses

Unnecessary fuse "blows" caused by momentary current overloads, can cause delays to high-production machines like the Power Press illustrated—delays which are frequently passed all the way down the production line.

Guard against these delays, caused by unnecessary "blows," with ECONOMY "De-Lay" Fuses. They give superior protection in the 135 to 200% overload range where "blows" are most frequent.

Ask the salesman of your Electrical Wholesaler now, for ECONOMY "De-Lay" Renewable Fuses and replacement Renewal Links, to protect all circuits.

Send for Latest Catalog

R-3406

ECONOMY FUSE & MFG. CO.
2717 GREENVIEW AVE. CHICAGO 14, ILL.

ECONOMY "DE-LAY"
RENEWABLE CARTRIDGE FUSES and RENEWAL LINKS

. . . the best of everything electrical

LOUDEST BELL EVER MADE!

Independent, certified tests* prove ADAPTABELS up to 420% LOUDER than any bells...at any price!

*RESULTS OF AN INDEPENDENT LABORATORY TEST prove the amazing superiority of Edwards 6" ADAPTABEL over the four other best-known brands of bells:

EDWARDS 6" ADAPTABEL IS:
58% LOUDER than 6" bell A
107% LOUDER than 6" bell B
142% LOUDER than 6" bell C
420% LOUDER than 6" bell D

NEED 10" VOLUME? GET IT WITH EDWARDS 6" ECONOMY! Do your signaling requirements call for a 10" bell? The same tests reported above proved that the 6" ADAPTABEL is from 66% to 115% LOUDER than the four leading 10" bells tested!

LOUDEST BECAUSE:

1 **HARDER HITTING.** Tests prove new Adaptabel plunger strikes gong shell with greater force.

2 **QUICKER RETURN.** New Adaptabel plunger rebounds from shell faster . . . far less interference with sound waves.

3 **MATCHED FREQUENCY.** The frequency of plunger strokes is timed perfectly to gong "breathing"—or sound waves.

LONGER LIFE! EASY TO INSTALL!
DIE-CAST HOUSING!
FITS ALL MOUNTINGS!
NO MECHANICAL CLATTER!

Your Distributor has these Adaptabels

New

ADAPTABEL

EDWARDS

Edwards Company, Inc., Norwalk, Conn. *In Canada: Edwards of Canada, Ltd.*

The best of everything electrical... via GraybaR

MUTUAL ENDORSEMENT

- BARE WIRES AND CABLES
- OK*—PEERLESS*—TIP-TOP* WEATHERPROOF WIRES
- GUARDIAN* BUILDING WIRES AND CABLES—THERMOPLASTIC AND RUBBER INSULATED
- ROMEX* AND ROMEX-T. NON-METALLIC SHEATHED CABLES
- VARNISHED CAMBRIC POWER AND CONTROL CABLES, THERMOPLASTIC AND THERMOSETTING JACKETED, BRAIDED, OR LEAD SHEATHED
- ASBESTOS AND ASBESTOS VARNISHED CAMBRIC WIRES AND CABLES
- SUPER SERVICE S* AND OTHER PORTABLE CORDS AND CABLES
- MAGNET WIRE OF ALL TYPES

*TRADE MARK REG. U.S. PAT. OFF.

IN PROCUREMENT... Two fundamentals apply, always. 1. Pick yourself a reliable source of supply. 2. Specify a definite manufacturer's product, for quality's sake...This page displays two names to which you can pin your faith, under all circumstances. Everything you need is there—modern-specification insulation; quality-guaranteed construction; intelligent, cooperative service—"MORE POWER TO YOU".

GENERAL CABLE
CORPORATION

OFFICES IN PRINCIPAL CITIES

...the best of everything electrical

Conduit installation Cost-Cutter...

Job time comes down, costs are cut sharply when you use a GREENLEE Hydraulic Bender. Accurate, smooth bends can be made by one man in but a few minutes in rigid conduit and pipe up to 4½", thin-wall conduit, tubing, and bus-bars. Many owners of GREENLEE Benders report time and labor savings of from 50% to 90% compared to previous methods of bending. Beyond this, the need for many manufactured bends and fittings is eliminated. As a result, this tool often pays for itself on the very first job. See your electrical distributor today for complete facts.

TOOLS FOR CRAFTSMEN

GREENLEE

ASK YOUR ELECTRICAL DISTRIBUTOR for information on GREENLEE Hydraulic Benders and these other timesaving tools: Hydraulic Pipe Pushers for pushing pipe under streets, railways, etc. • Hand Benders • Cable Pullers Knockout Punches and Cutters • Electricians' Auger Bits • Bit Extensions • Joist Borers • Spiral Screw Drivers • Automatic Push Drills • and many more. Greenlee Tool Co., Division of Greenlee Bros. & Co., 1751 Columbia Ave., Rockford, Illinois.

The best of everything electrical... *via* GraybaR

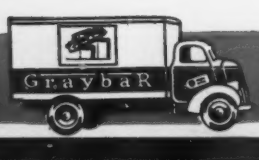
HUBBELL *Twist-Lock* DEVICES

They never disconnect accidentally!

Whether in laboratory or with oil burners, it is extremely important no interruptions occur in electrical power.

Twist-Lock **Devices eliminate time-losses and annoying delays because they "stay put"—are vibration-proof — assure a lockfast electrical connection under the most trying conditions — are available polarized and grounded for safe operation!**

HARVEY HUBBELL, INC. HUBBELL **BRIDGEPORT, CONN.**



...the best of everything electrical

NEW! "PRV" MODEL
Power Roof Ventilator
(DIRECT-DRIVE CENTRIFUGAL FAN TYPE)

NEW *Efficiency!*
NEW *Economy!*
NEW *Convenience!*

EASILY INSTALLED—
WIRED—SERVICED

ILG-designed, ILG-built for efficient, trouble-free exhaust duty from vertical flues in multi-story buildings or from duct systems. 10 sizes to operate against resistances from ¼" to 1½". Check these features:

LOAD-LIMITING WHEEL—BC type centrifugal fan wheel with non-overloading feature, mounted directly onto motor shaft. 360° radial discharge.

BALL-BEARING MOTOR—Vertical type, of proven ILG design, not affected by dust, grease and lint in air being exhausted.

WEATHER-PROOF HOUSING—Of galvanized steel or copper. Presents low, handsome silhouette.

LEAK-PROOF CONSTRUCTION—Roof extends over discharge baffles and base. Discharge louver openings below wheel rim. Exclusive leak-proof flange on base.

FLEXIBLE—Available less shutter, with automatic gravity or motor operated shutter, or with combination shutter and variable air controller (mounted in base of unit.) Standard unit provided with access door and shutter track for conversion to any type air control at or after installation.

EASY INSTALLATION, SERVICING—Composed of just six major assemblies. Equipped with electrical box and safety switch for easy wiring. Hinged top and access door in base simplify servicing.

ILG "ONE-NAME-PLATE" RESPONSIBILITY—Covers entire unit including motor.

NEW BULLETIN illustrates and describes the new ILG "PRV" line. Gives specifications, capacities, dimensions, weights. Phone nearby branch office or write for your free copy today.

Send Today!

ILG
REG. U. S. PAT. OFF.

ILG ELECTRIC VENTILATING COMPANY
2879 North Crawford Avenue, Chicago 41, Illinois
Offices in more than 40 Principal Cities. Consult Classified Directory

The best of everything electrical . . . via GraybaR

Litecontrol Fixtures
are Eye Insurance

at THE AMERICAN INSURANCE GROUP
New York City

Lighting Equipment: 77 Litecontrol No. 9234 surface-type fixtures

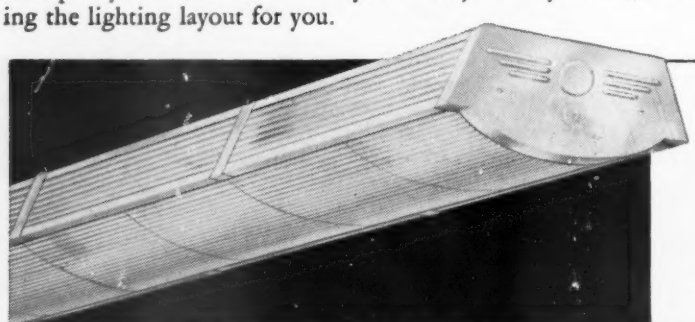
Spacing: 10 foot centers

Lamps per fixture: 4-40 watt, 4500° white F.

Footcandles: 35 in service (average)

You'll find it's always good policy to recommend Litecontrol fixtures to your customers. No question about it—you'll be doing them, and yourself, a real favor. For instance, they'll like the flood of glareless light that will speed sales and increase office efficiency. And they'll like the low power bills, the smart designs, the extra-sturdy construction.

Naturally, their satisfaction will mean better future business for you. So, why not specify Litecontrol units on your next job? If you like, we'll help by making the lighting layout for you.



Cat. No.	No. of Lamps	HOUSING Length	Width	Height	Approx. Ship. Weight
9224	2-40W	48⅛"	15"	6¾"	46 lbs.
9234	3-40W	48⅛"	15"	6¾"	51 lbs.

End Caps — 9200-3

This Surface-type Lens Unit . . .

. . . used so successfully at The American Insurance Group office . . . is optically engineered to give ceiling-reflected light as well as intensive downward illumination. Available for either two or three 40 watt fluorescent lamps. Write today for new catalog.

LITECONTROL CORPORATION
36 PLEASANT STREET, WATERTOWN 72, MASSACHUSETTS

LITECONTROL
Fixtures
KEEP UPKEEP DOWN

DESIGNERS, ENGINEERS AND MANUFACTURERS OF FLUORESCENT LIGHTING EQUIPMENT DISTRIBUTED ONLY THROUGH ACCREDITED WHOLESALERS

GraybaR
. . . the best of everything electrical

Any Way You Check It

- Speed
- Cost
- Ease of Use
- Safety
- Strength
- Quality

NEW LOW PRICES

IDEAL

Wire-Nuts*

THE SOLDERLESS, TAPELESS WIRE CONNECTORS

Patented, No. 1,933,555

Are the Best Wire Connectors

*Trade Mark Reg. U.S. Pat. Off.

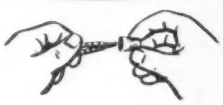
For more than 20 years leading electrical contractors have been doing better circuit and fixture wiring with "Wire-Nuts", the original mechanical type wire connector . . . Millions in use!

There are at least *six reasons* why IDEAL "Wire-Nut" connections are preferred to all others. They are six reasons why, if you are not now using them, *you should be!*

- **Speed** — simply screw on — like a nut on a bolt! Connect any ordinary combination of wires from two No. 10 up to three No. 18 solid and/or stranded in just a few seconds. *Speed wiring changes*, additions and repairs, because they're easy to unscrew and use again. Simplify the adding of new circuits and making temporary connections. — no wires to cut, no short ends.
- **Cost** — "Wire-Nuts" are lower in cost and make each connection faster.
- **Ease of Use** — Eliminate use of tools required by other methods.
- **Safety** — A "Wire-Nut" connection is electrically SAFE, fully insulated — not affected by heat, cold or moisture.
- **Strength** — Cannot shake loose or pull out. Spiral spring insert twists wires and presses in the threads — holds with a vise-like grip.
- **Quality** — "Wire-Nuts" are made to highest precision standards . . . must pass pull-out (strength) test, resistance test, insulation test (2500V.) and weather tests.

Isn't it time you put all these advantages to work for you? Get a box of "Wire-Nuts" at your electrical wholesaler's TODAY . . . IDEAL INDUSTRIES, Inc., Sycamore, Illinois.

Only "WIRE-NUTS" Give You All These Advantages



EASIER TO USE. Just screw on — that's all! No solder, tape or tools.

RESIST PULL-OUT. A "Wire-Nut" joint of two No. 14 wires will stand up to 176 pound pull.

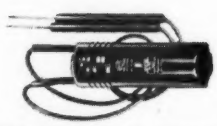
VIBRATION PROOF. Will not shake loose even under heavy vibration.

SAFE. Wire joint covered by plastic shell that prevents "grounds" and "shorts."

TOP QUALITY. Built to precision standards. Inspected and tested with laboratory care.

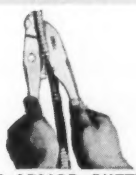
APPROVED. IDEAL "Wire-Nuts" are listed by Underwriters' Laboratories, Inc., and approved by other leading electrical authorities.

And Don't Overlook These Other Tools That Cut Job Costs



IDEAL VOLTAGE TESTER
Not an ordinary "glo" type — actually indicates nominal line voltage from 110 to 600 volts — AC or DC. Solenoid indicator AND neon test lamp GIVE DOUBLE PROTECTION. Includes carrying case.

NEW "Stripmaster" WIRE STRIPPER
New, revolutionary design with "one squeeze" operation. Exclusive, automatic feature holds jaw open while wire is removed — positively prevents crushing of stranded wire. Sizes for all wire, 8 to 22.



B-X ARMOR CUTTER
Just snip—that's all! Cuts two or three-wire No. 10, No. 12 or No. 14 cable armor. Cuts anywhere along length of cable for opening into junction boxes, etc. Cutting blade removable for sharpening.

NEW IDEAL "Coil-Flex" FISH TAPE
"Spring-type" — speeds wire pulling in all kinds of conduit. Round surface minimizes slide resistance.
"Flat-type" Fish Tape and Reels also available in popular sizes.

IDEAL

IDEAL INDUSTRIES, Inc., Sycamore, Illinois

The best of everything electrical . . . via GraybaR

MERCOID

AUTOMATIC CONTROLS FOR INDUSTRIAL APPLICATIONS REQUIRING POSITIVE CONTROL OF PRESSURE, TEMPERATURE, LIQUID LEVEL ETC.

SIMPLE TO ADJUST FOR THE SPECIFIED OPERATING RANGE

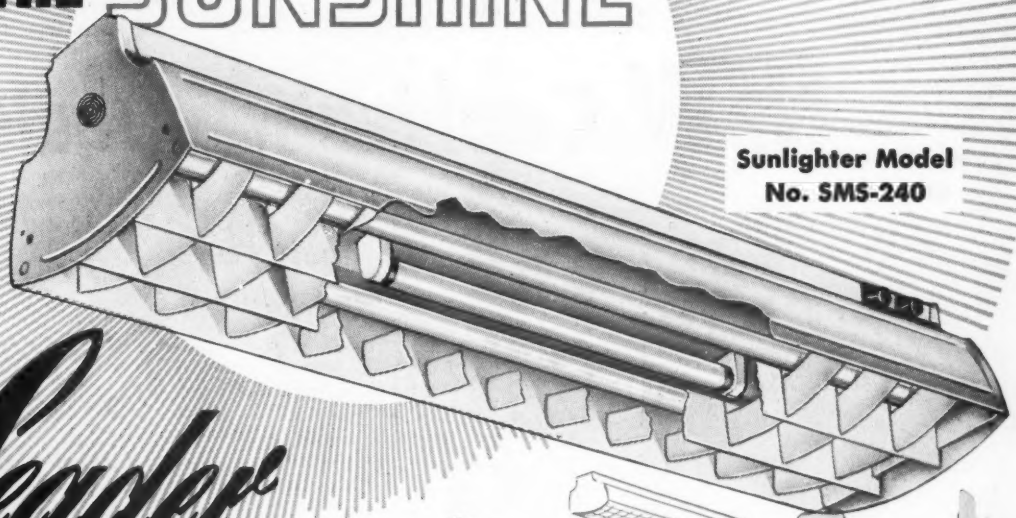
MERCOID CONTROLS ARE EQUIPPED WITH MERCURY SWITCHES, THEREBY INSURING GREATER SAFETY, BETTER PERFORMANCE AND LONGER CONTROL LIFE

WRITE FOR CATALOG 600-B. PLEASE MENTION THIS PUBLICATION

THE MERCOID CORPORATION
4201 BELMONT AVE. CHICAGO 41, ILL.

Graybar ... the best of everything electrical

TURN ON THE SUNSHINE



Sunlighter Model
No. SMS-240

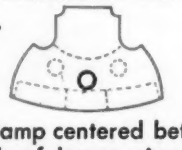
The NEW Leader SUNLIGHTER

(First successful sun-ray reproduction over large areas)

Excellently suited for use in CLASSROOMS GYMNASIUMS · ASSEMBLY HALLS · HOSPITALS SANITARIUMS · OFFICES FACTORIES · BOWLING ALLEYS

At last, a reproduction of the sun's most desirable ultra-violet rays—the rays that tan the skin to a robust tone, produce Vitamin D; help in the deposition of calcium for sounder teeth and more rugged bones, to cure and/or to ward off rickets; *all* the benefits to health of the sun's ultra-violet rays.

A 3-lamp ensemble



STAYS COOL

with the sun-lamp centered between lighting lamps. Length of lamps gives effectiveness over large area . . . Available in 64", 72" and 96" LEADER Slimline models. Also in LEADER SM-240 (4 ft.) and SM-2-100 (5 ft.) . . . 40/60 LIGHT DIFFUSION—plus sun-rays . . . Complete specifications upon request.

LEADER leads again!
IMMEDIATE DELIVERY on this revolutionary fixture!

Not a theory for the future but an actuality for immediate delivery: LEADER'S SUNLIGHTER—a 2-in-1 fluorescent fixture of quality illumination and a successful duplication of sunlight's ultra-violet rays.

Here is a sun-lamp fixture that eliminates the faults of previous sun-lamps. The first ultra-violet radiations similar to sunlight: 2800-to-3200 Angstrom band . . . a continuous band concentrated in the most biologically effective spectral region . . . produces Vitamin D in very substantial quantities . . . (Undesirable wave-lengths are blocked out . . . lamp stays cool to the touch during use!)

Sold and installed only by the better electrical wholesalers and contractors

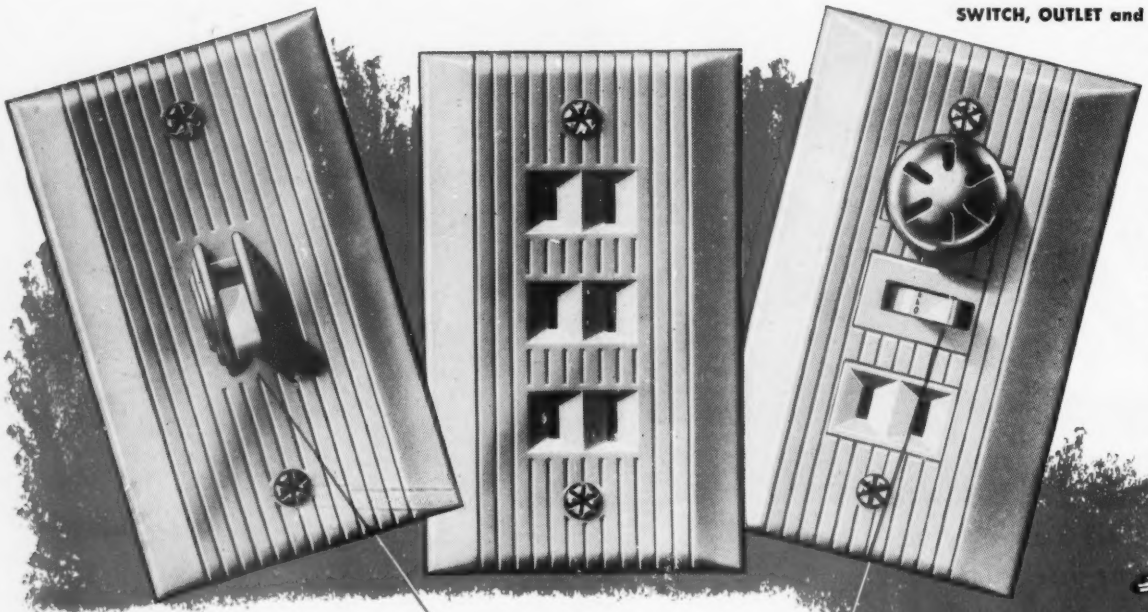
LEADER ELECTRIC COMPANY
3500 North Kedzie Avenue, Chicago 18, Ill.
West Coast Factory: 2040 Livingston, Oakland 6, Cal.

The best of everything electrical . . . *via* GraybaR

MONOWATT
INCORPORATED
A General Electric Affiliate
PROVIDENCE, R. I.

AND
COST-CUTTING

NEW Combination Devices Reduce



SWITCH, OUTLET and PILOT LIGHT COMBINATIONS

Made in combinations of four devices:—Single Pole and Three Way Switches, Outlets, and Pilot Lights in Brown and in Ivory.

Cat. No. 4046—Pilot Light, Single Pole Switch, Outlet & Plate (illus.)

Cat. No. 4024—Two Single Pole Switches & Plate.

Cat. No. 4026—Single Pole Switch, Pilot Light & Plate.

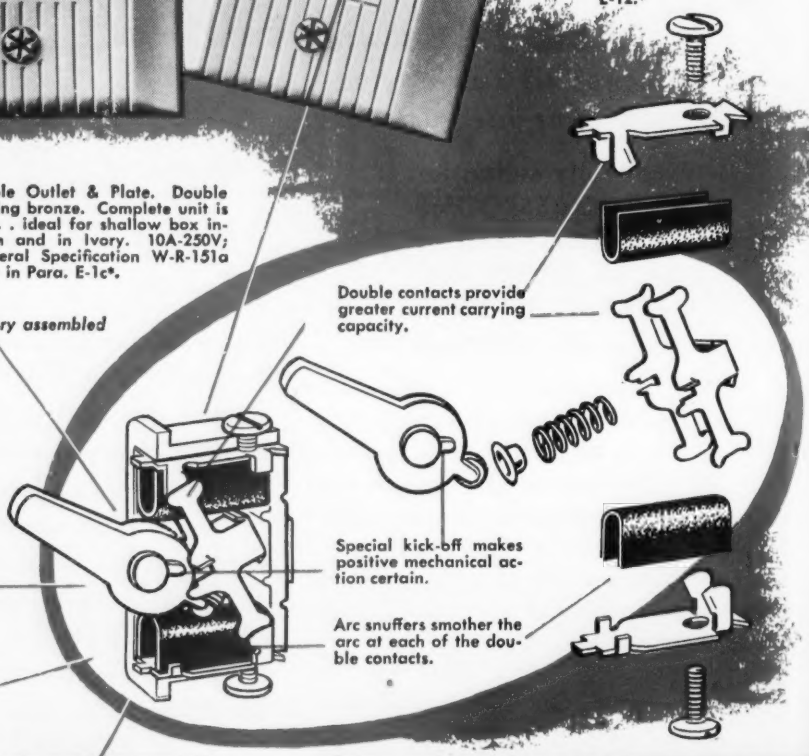
Cat. No. 4041—One Single Pole Switch, Two Outlets & Plate.

Switches "T" rated, 5A-250V; 10A-125V. Outlets, 10A-250V; 15A-125V. Pilot lights (6 watt lamp), 75W-125V. Meet Federal Specification W-S-893, except for technicality in Para. E-12.*

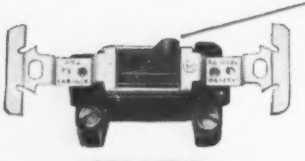
Cat. No. 1321—"T" Rated Single Pole Switch & Plate. **Cat. No. 1323**—"T" Rated Three Way Switch & Plate. In Brown and in Ivory. 5A-250V; 10A-125V. Meet Federal Specification W-S-896 except for technicality in Para. E-12*.

Cat. No. 1223—Triple Outlet & Plate. Double contacts of heavy spring bronze. Complete unit is less than 7/8" deep . . . ideal for shallow box installations. In Brown and in Ivory. 10A-250V; 15A-125V. Meet Federal Specification W-R-151a except for technicality in Para. E-1c*.

Requires a metal mounting strap. These devices are factory assembled **on the plate to make a one-piece easy-to-install unit.*

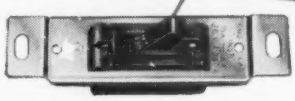

Double contacts provide greater current carrying capacity.
Special kick-off makes positive mechanical action certain.
Arc snuffers smother the arc at each of the double contacts.

Cat. No. 1342—"T" Rated Single Pole Switch on Brown Plastic Cover. **Cat. No. 1344**—"T" Rated Three Way Switch on Brown Plastic Cover. Fit both 3¼" and 4" boxes. 5A-250V; 10A-125V. Meet Federal Specification W-S-890.



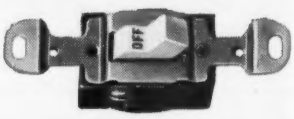
TOP-WIRED

Cat. No. 1314—"T" Rated Single Pole Switch. **Cat. No. 1315**—"T" Rated Three Way Switch. Removable Plaster Ears. In Brown and in Ivory. 5A-250V; 10A-125V. Meet Federal Specification W-S-896.

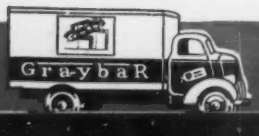


Cat. No. 1308—"T" Rated Single Pole Switch. **Cat. No. 1309**—"T" Rated Three Way Switch. Same quality as 1314-15 but without plaster ears. End-Wired.
In Brown and in Ivory. 5A-250V; 10A-125V.
Meets REA Specifications

LOW COST



Cat. No. 1301—Single Pole Switch. **Cat. No. 1303**—Three Way Switch.
In Brown and in Ivory.
5A-250V; 10A-125V



. . . the best of everything electrical

DON'T FORGET THESE DEVICES ARE SPECIFICATION GRADE

R&A

Both Device and Plate to one installation unit

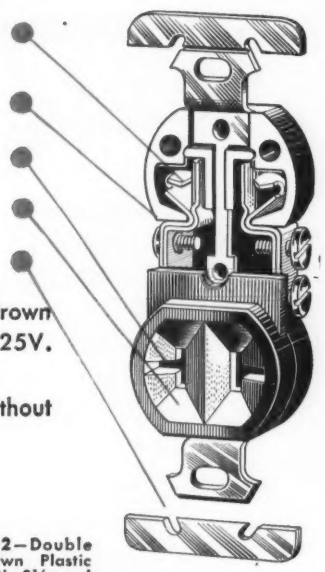
COST LESS TO BUY. You save about one-fourth the cost of separate devices of equal quality . . . you get three outlets at less than the cost of two.

COST LESS TO INSTALL. (1) Just two screws mount the complete unit. (2) Combining plate with device makes flush mounting automatic . . . eliminates adjustments. (3) Oval screw holes give ample leeway for squaring. (4) Fiber washers hold screws for quick mounting . . . prevent loss of screws and fumbling.

GIVE A BETTER JOB. Smart. Modern. One piece assembly of 1223 and 1321-23 eliminates dust catching space between device and plate.

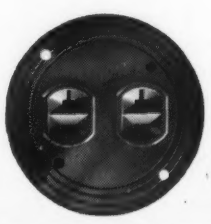
DOUBLE OUTLETS *BUILT FOR SERVICE*

1. **Double-sided spring bronze contacts**
2. **Thick plastic housing**
3. **T-Slots**
4. **Modern functional styling**
5. **Removable plaster ears**



Cat. No. 1209 – Double Outlet. In Brown and in Ivory 10A-250V; 15A-125V.
Meet Federal Specification W-R-151a

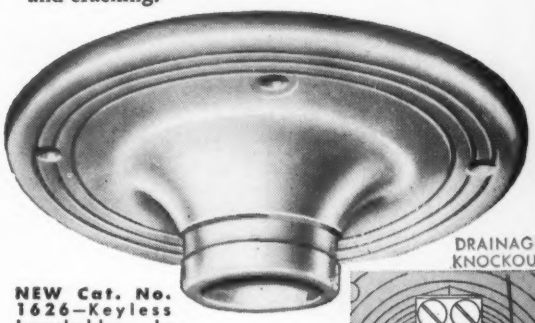
Cat. No. 1208 – Same as 1209, without plaster ears.



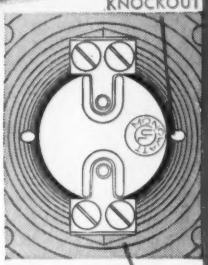
Cat. No. 1232—Double Outlet on Brown Plastic Cover. Fits both 3¼ and 4" boxes. "T" Slots. Double sided spring bronze contacts. 10A-250V; 15A-125V. Meets Federal Specification W-R-151a.

WIRING COSTS COME DOWN WHEN THESE GO UP!

These modern plastic ceiling lampholders are designed for speed in wiring plus dependability. There is no internal mechanism to fuss with, no porcelain ring to work loose or crack. Units fit both 3¼" and 4" boxes, cutting inventory requirements in half . . . weigh half as much as porcelain and are more resistant to chipping and cracking.



DRAINAGE KNOCKOUT



NEW Cat. No. 1626—Keyless Lampholder. In Brown and in Ivory. 660W-250V. Meets Federal Specification W-L-142.

NEW . . . Double terminal screws for continuous wiring . . . eliminate soldering and taping. This feature, standard on duplex convenience outlets now available in a lampholder!

WIRE LUG

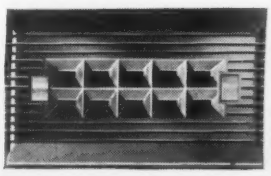
Cat. No. 1620—Pull Chain Lampholder. In Brown and in Ivory. 250W-250V. Meets Federal Specification W-L-142.

Modern design reduces wiring to a quick two-step job: (1) Secure code wire; (2) Screw unit to outlet box.

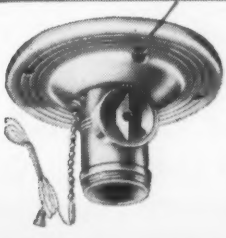
DEVICES ** FOR MODERATE PRICED JOBS

** *Listed by Underwriters' Laboratories . . . but not Specification Grade*

Cat. No. 1201—Double Outlet. In Brown and in Ivory. ● 10A-250V; 15A-125V.



Cat. No. 1225—Five Outlet & Plate. Combined in one installation unit. In Brown and in Ivory. 10A-250V; 15A-125V.



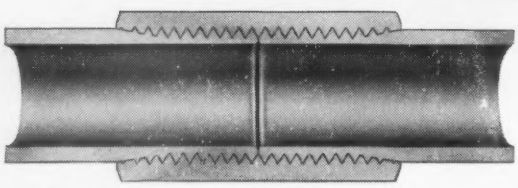
Cat. No. 1612—Pull Chain Lampholder with Two Outlets. Lampholder, same quality as 1620; side outlets, with single contacts especially formed to grip plug blades firmly, not controlled by pull chain. In Brown and in Ivory. 250W-250V

The best of everything electrical . . . *via* GraybaR

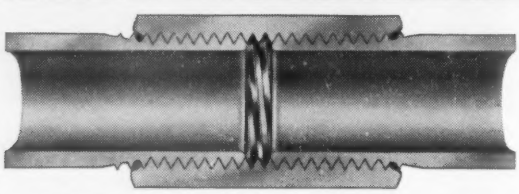
IT'S FORTIFIED FOR LIFE-TIME PROTECTION

SPECIFY NATIONAL ELECTRIC SHERARDUCT

To Keep Wiring Safe, PERMANENTLY



SHERARDUCT COUPLING—All surfaces and threads are Sherardized. Accurately undercut threads permit completely closed joints—no raw threads exposed—no gaps to interfere with the easy fishing of wires.



ORDINARY COUPLING—Raw threads meet raw threads—accelerates rust—weakens joint. Threads exposed in gaps trap wire ends and make the fishing of wires difficult.

FULL WEIGHT . . .

THREADED . . .

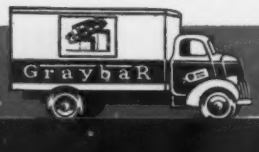
RIGID STEEL CONDUIT

When the job calls for a conduit that must withstand the test of time—there's only one *Sherarduct!* Sherarduct is a rigid steel conduit that is permanently rust-proof. The zinc protective coating alloyed to the steel by the special Sherardizing process will not crack or peel. Sherarduct is heavy-walled, threaded, smooth inside to assure easy fishing.

NATIONAL ELECTRIC PRODUCTS NE WIRING 6 SYSTEMS WIRES AND CABLES

National Electric
PRODUCTS CORPORATION

1301 CHAMBER OF COMMERCE BLDG., PITTSBURGH 19, PA.



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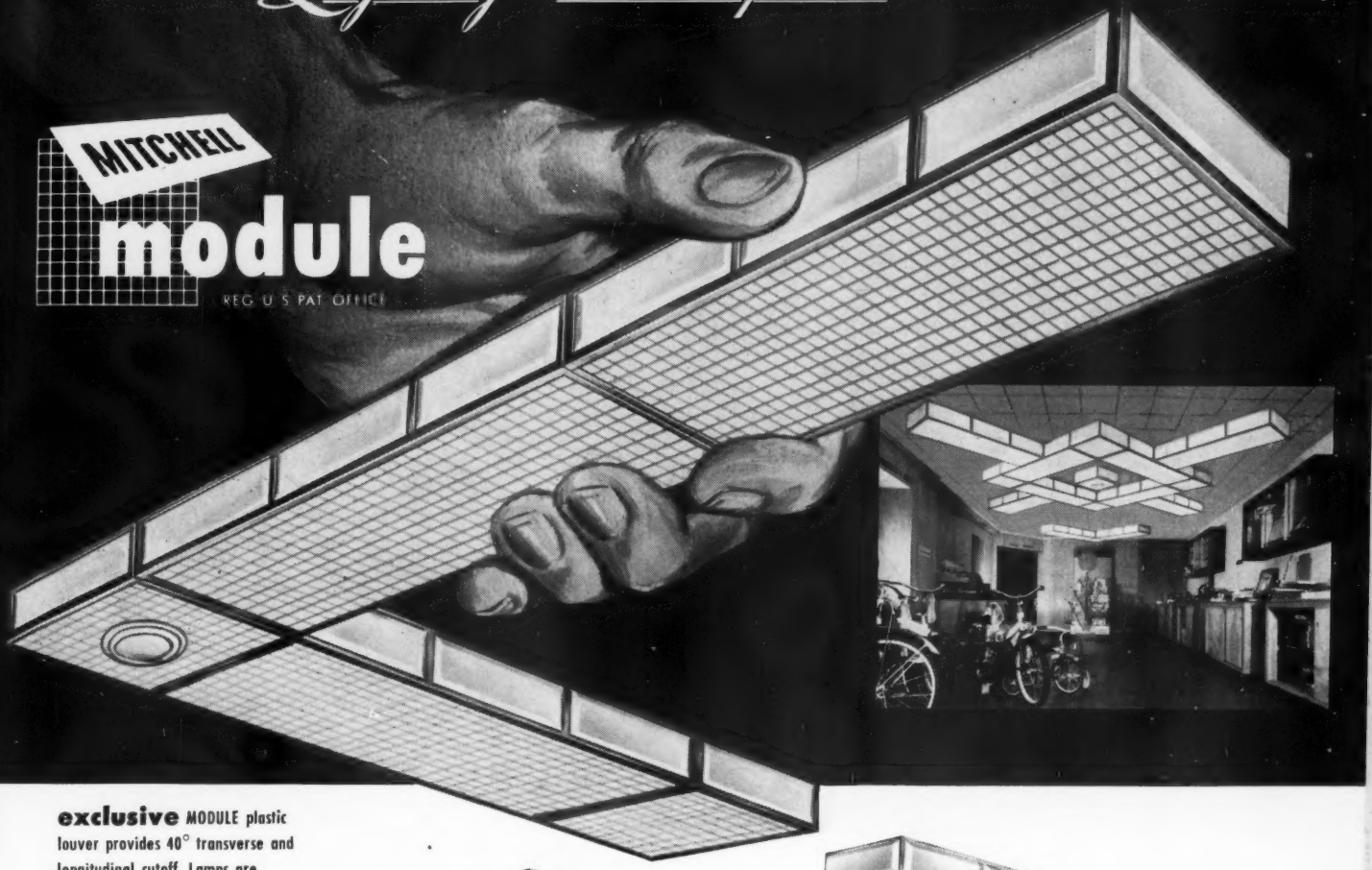
the greatest *Lighting Development* since the fluorescent lamp

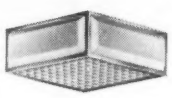
MITCHELL module

REG U S PAT OFFICE

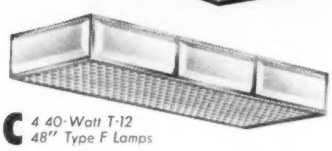


exclusive MODULE plastic louver provides 40° transverse and longitudinal cutoff. Lamps are shielded at all normal viewing angles, yet light transmission is maximum.

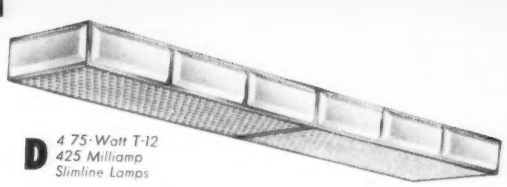
B 32-Watt 12" Circline Lamp, and 1 PAR Spot or Flood Lamp



A 4 14-Watt T-12 15" Type F Lamps



C 4 40-Watt T-12 48" Type F Lamps

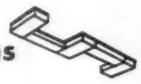


D 4 75-Watt T-12 425 Milliamp Slimline Lamps

these 4 low-cost modules are the "building blocks"

of a perfect custom-fitting lighting installation . . .

they fit together perfectly end to side end to end

side to side . . . to form more than 50,000 different lighting patterns 

. . . to fit any ceiling shape or size . . . mixing all

light sources in one harmonious system . . . with

equal brightness throughout (no dark sides or ends) . . . so you

can put the light where it is needed!

Only MITCHELL makes MODULE

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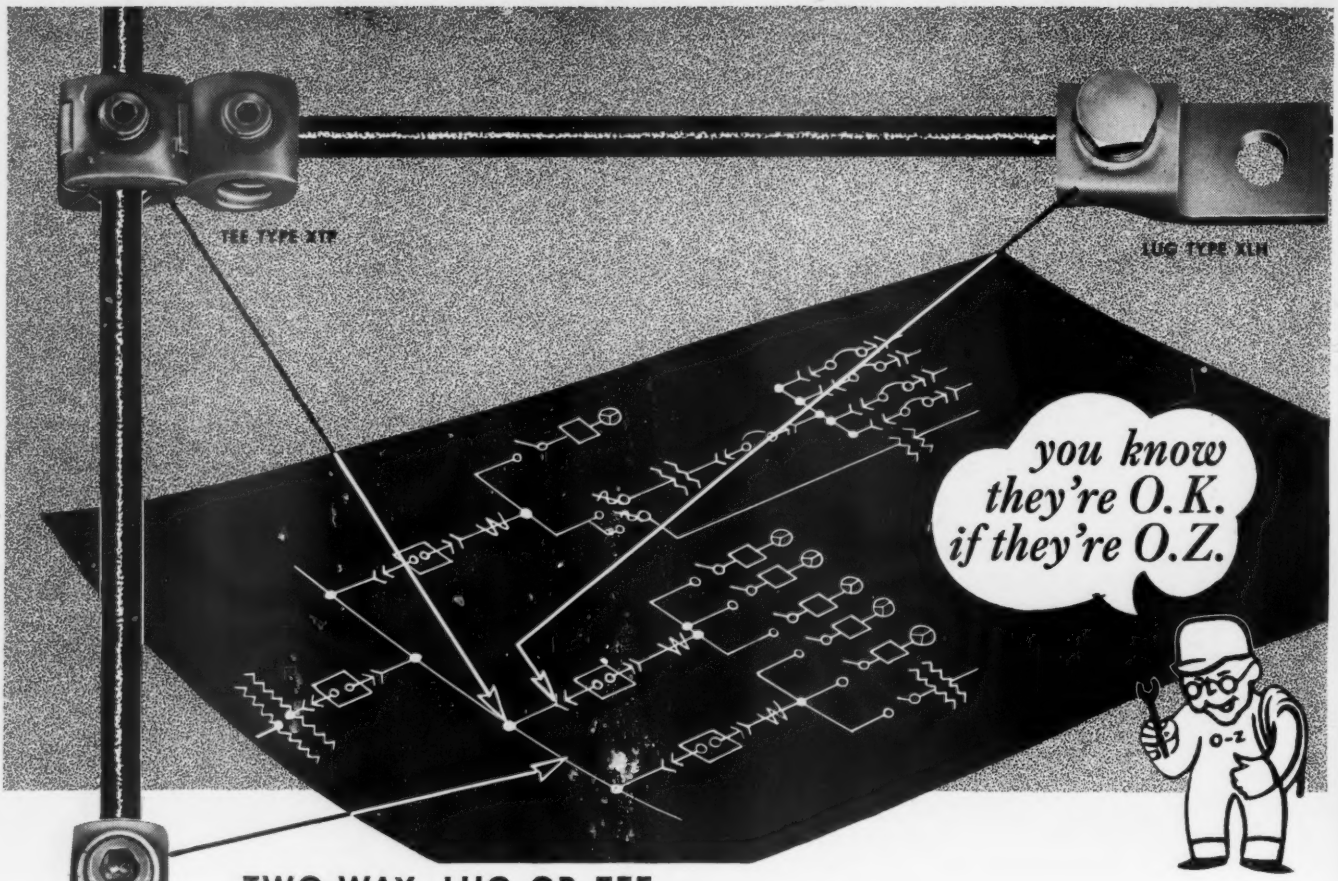


TWO-WAY, LUG OR TEE . . .

GET PERMANENT CONNECTIONS WITH ALL THREE . . .

TWO-WAY TYPE XW

Whenever you're tapping, butting, terminating, put in **O.Z.** solderless connectors—then you're sure of permanent connections . . . *always*. There's a solderless connector in O. Z.'s complete line of thirty different types that will assure you fast, easy installation—as well as positive, strong connections—on any wire in any of the wide range of sizes used in building installations. Here are a few of the features that make O. Z. solderless connectors outstanding:

Tin-plated spring steel lock washers that hold their resiliency, maintain pressure—permanently.

Serrated pressure plates that give maximum bite for positive grip.

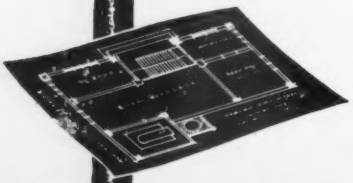
Highly conductive copper alloy body that is acid dipped to assure low resistance contact.

Extra strong copper alloy bolts and hinged parts that guarantee strong contacts, give lasting mechanical strength.

Simplicity of one-piece construction for speed of assembly—no parts to lose.

Ask nothing less than permanency of the connectors you use! Ask your distributor for O. Z. solderless connectors. He can supply an O. Z. connector for every type of application. He also carries a full line of O. Z. Insulated Bushings, End Fittings, and Split Couplings—equally unmatched for performance!

All types of O. Z. solderless connectors are satisfactory for aluminum building wire if ordered with the special Cadux plating.

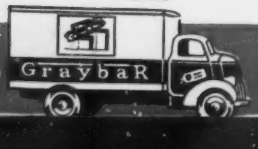


3698

CONDUIT FITTINGS
SOLDERLESS CONNECTORS
CABLE TERMINATORS
CAST IRON BOXES
POWER CONNECTORS
GROUNDING DEVICES

O.Z. ELECTRICAL MANUFACTURING COMPANY

262 BOND STREET · BROOKLYN 2, N. Y.



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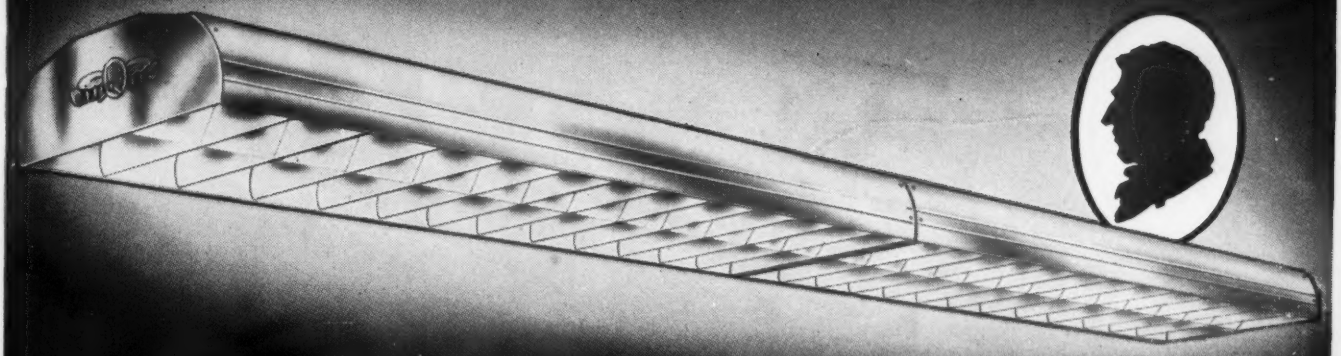
new highs *in* EFFICIENT & ECONOMICAL LIGHTING FOR SCHOOLS AND OFFICES



THE "Monroe" * in 4 and 8-Foot MODULES FLUORESCENT LUMINAIRES

— Check these Advantages —

● **ECONOMICAL INITIAL COST**
Simplified design and construction of the basic chassis, side-panels and reflecta-louver assembly result in production economies which are passed on to the ultimate users.

● **LOW INSTALLATION COST**
One man, working from the side and not from the bottom, hangs the bare chassis in a minimum of time. Side-panel and reflecta-louver assembly snap into position *after* the chassis is hung; no tools required. The 8-foot chassis requires less hangers and less installation time.

● **MAXIMUM EFFICIENCY**
Permaflector Lighting Engineers have designed the Monroe to give efficiencies up to 83% with 25-35 shielding. Brightness comes well within the I.E.S. recommendations.

● **SIMPLIFIED MAINTENANCE**
Cleaning or relamping is fast and simple. Reflecta-louver assembly hinges down from either side; full-length fibre-plate snaps out quickly for easy access to wiring channel and ballast.

● **FLEXIBLE APPLICATION**
Plastic, aluminum or steel side-panels . . . reflector-closures that attach for totally direct lighting . . . and individual or inline installation with or without hangers—make the Monroe the "ideal" unit for many varied applications.

THESE ADVANTAGES ADD UP TO
ALL AROUND LIGHTING ECONOMY!

Write today for complete details on this exceptional series of fluorescent luminaires.

Pittsburgh Permaflector

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PITTSBURGH 22, PENNSYLVANIA
Permaflector Lighting Engineers in All Principal Cities
Distributed by Better Electrical Wholesalers

PITTSBURGH REFLECTOR COMPANY
404 Oliver Bldg., Pittsburgh 22, Pa.
Please send me your bulletin which describes the Monroe Series in detail and shows specification, photometric and installation details.

Name_____

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Company_____

Street_____

City_____ Zone____ State_____

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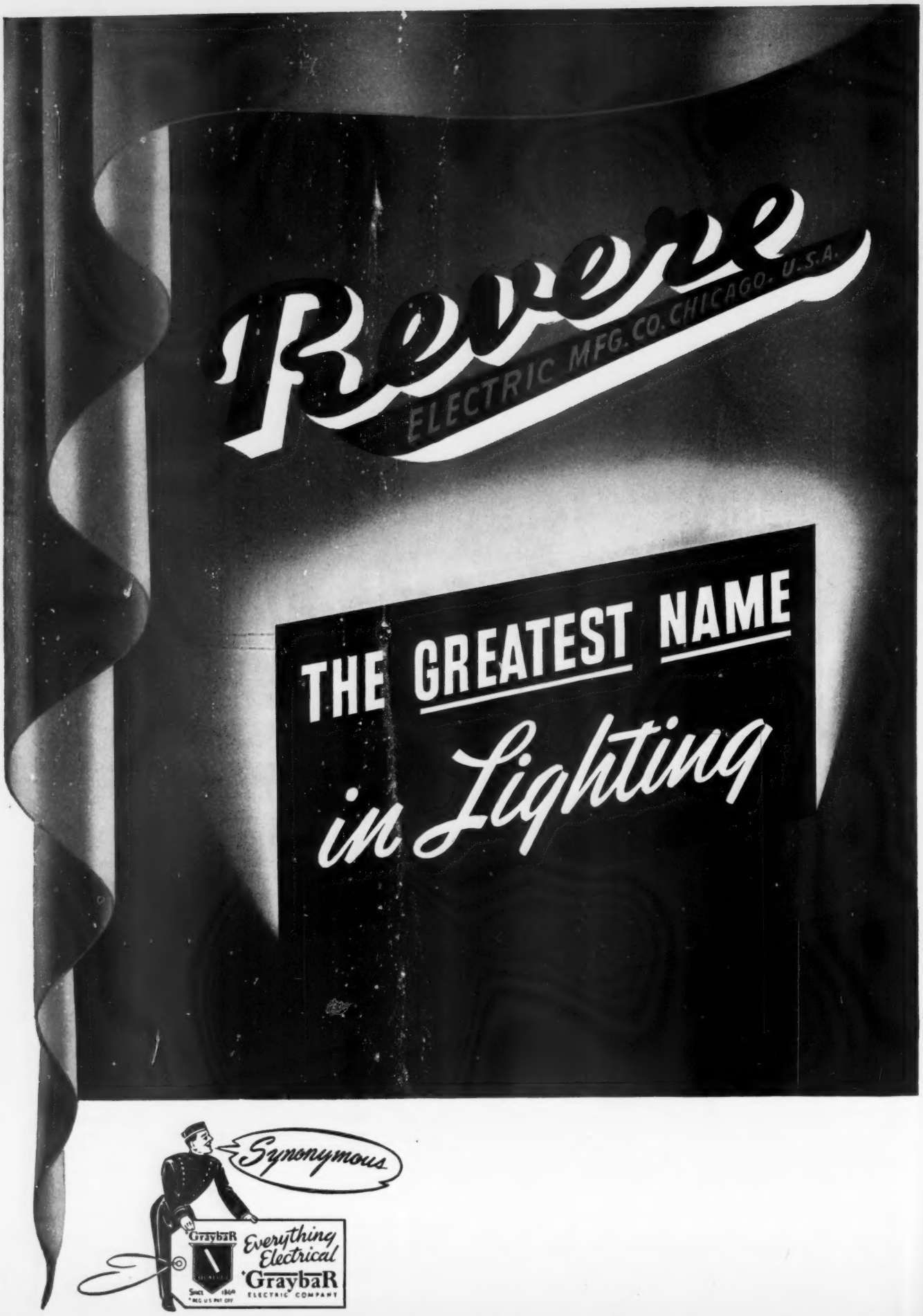

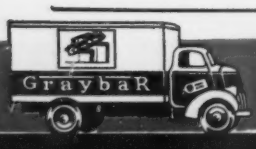

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P&S

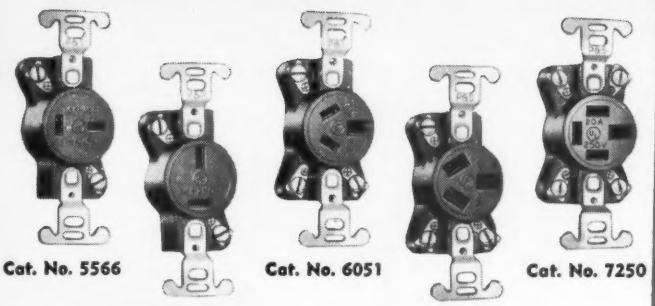
NEW

COMPLETELY REDESIGNED

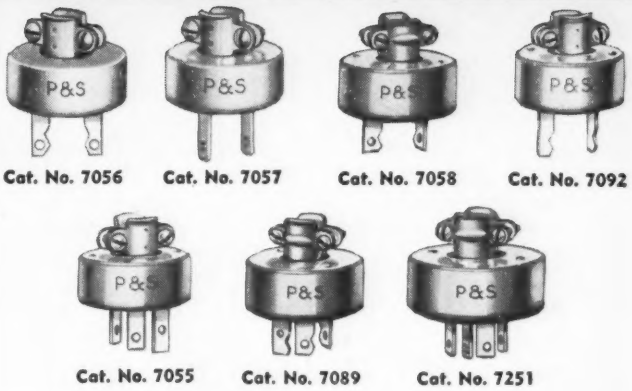
P&S POLARIZED RECEPTACLES AND CAPS

- BUILT FOR LONG LIFE
- EASY TO INSTALL
- 2, 3, and 4-WIRE
- 10 and 20 AMPERES

A "MATCHED" LINE — All Molded Parts of Black Bakelite



Cat. No. 5566 Cat. No. 5552 Cat. No. 6051 Cat. No. 6810 Cat. No. 7250



Cat. No. 7056 Cat. No. 7057 Cat. No. 7058 Cat. No. 7092

Cat. No. 7055 Cat. No. 7089 Cat. No. 7251

All P&S Polarized Receptacles Feature:

- Top wired terminals for wiring ease
- Extra heavy, strong bakelite bodies
- Long life contacts — springs far removed from arcing point
- Rugged terminals fastened in depression in body with "ear" formed on corner to force wire around screw
- No. 8 binding screws — ample for No. 10 wire
- Plaster ears — required for Gov't Specifications — scored for easy removal

All P&S Polarized Caps Feature:

- Cord grips which will take from smallest to largest wire sizes ordinarily used
- No. 8 binding screws spun over so cannot fall out — long enough to be backed out for wiring ease
- Large tapered wireways — bring wires down firmly under screws
- Strong cap blades firmly riveted
- Rivets anchoring terminals spun over on inside
- Fibre insulating discs partly inserted — easy to remove for wiring

STANDARDIZE ON P&S POLARIZED DEVICES

PASS & SEYMOUR, INC. • SYRACUSE 9, NEW YORK

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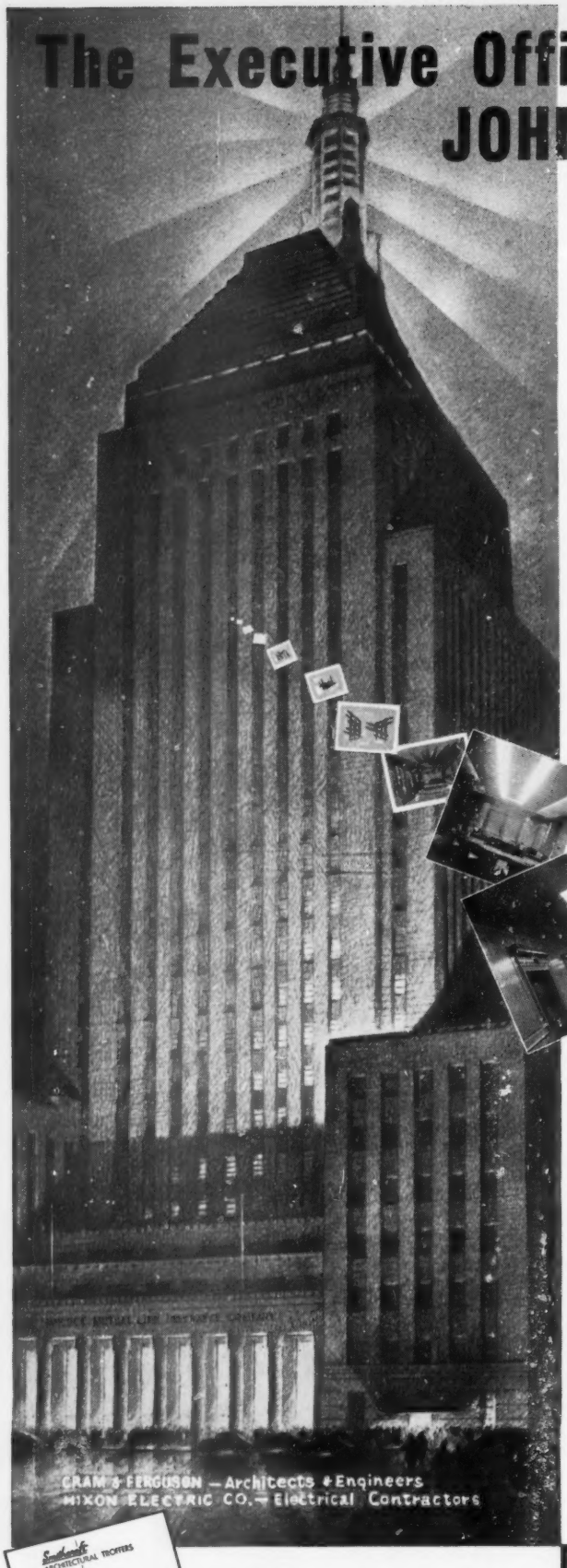
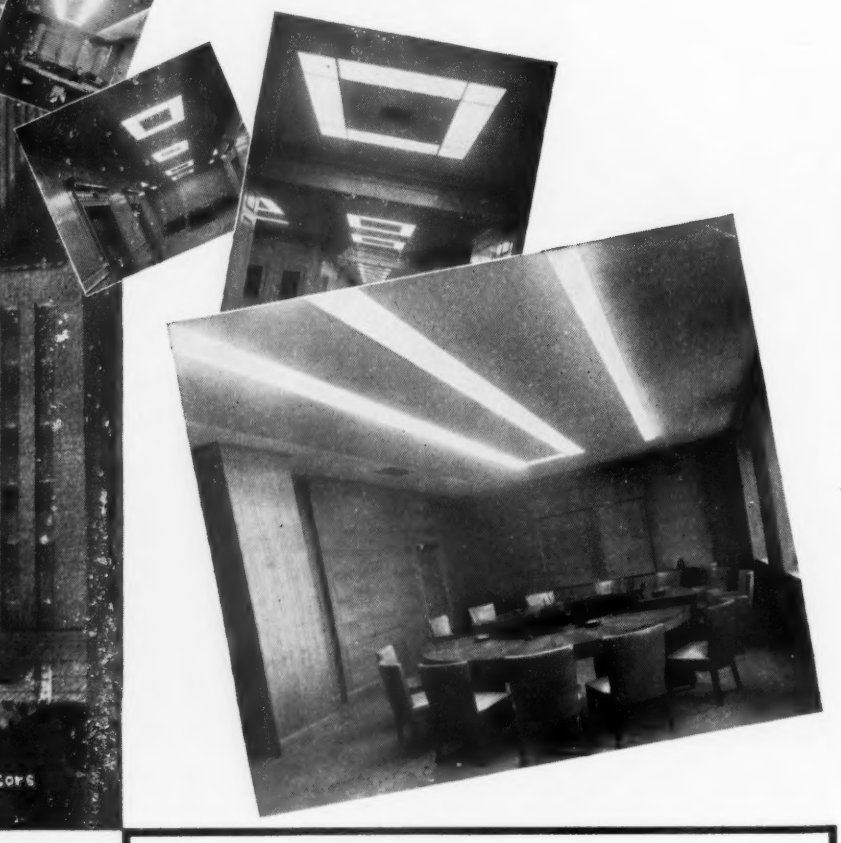
The Executive Offices of the New JOHN HANCOCK BUILDING ARE LIGHTED BY Smithcraft TROFFERS



Smithcraft Troffers (with Albalite glass) were chosen for the entire executive floor of the new John Hancock Building in Boston. Pattern lighting was required . . . and Smithcraft Troffers were selected because they permit complete freedom of lighting "expression" by the architect — without use of special or expensive accessories. Smithcraft Troffers effectively cut down the usual time and cost of installing recessed fixtures, because only Smithcraft provides the patented Aligner Hanger, cushioned Glass Frame, captive reflector fasteners, as well as unexcelled light distribution. These are features of importance to architect, engineer and contractor . . . features that make Smithcraft Troffers "America's Finest Recessed Lighting Fixture".



There's a 20-page booklet "Architectural Troffers" that tells you why Smithcraft Troffers are being specified for more and more outstanding installations throughout the country. Send for your copy today.

Smithcraft
LIGHTING DIVISION
CHELSEA 50, MASSACHUSETTS

. . . the best of everything electrical

SIMPLEX PRESENTS..

3 ways to [CUT WIRING COST INCREASE WIRING EFFICIENCY]

Simplex-Anhydrex Cables . . .

Can be buried directly in earth, installed in ducts and conduit or run through open air. Anhydrex insulation provides sound electrical properties plus unusual stability in the presence of water and moisture. A tough neoprene jacket assures protection against abrasion, soil acids and alkalies, oils, heat, flame and sunlight. Not subject to electrolysis and corrosion, easy to install, splice and terminate. Ideal for industrial power lines, street, park and airport lighting, series lighting circuits, and for underground service entrance. Write for Catalog 985-A.

Simplex-Anhydroprene Cables . . .

Consist only of a coated copper conductor, Anhydrex insulation, and a thin wall of neoprene. Are light in weight and small in diameter. Can be used in open air or raceways in buildings, in conduit, or underground in ducts. Recommended for plant and shop wiring, signal and control circuits, instrument wiring, and for use as Type RW Building Wire. Write for Bulletin 115.

Simplex-Tirex Portable Cords and Cables . . .

Feature the toughness, flexibility, and electrical stability that mean trouble-free performance under all service conditions. Protected by Selenium Neoprene Armor, the cured-in-lead jacket that assures balanced resistance to rough handling, oil, grease, chemicals, sunlight, heat and flame. Sizes and types available for all portable equipment from hand tools, welding machines and lighting units to heavy shovels and cranes. For a description of the "plus values" they provide, write for Folder 993.

SIMPLEX WIRES & CABLES

SIMPLEX WIRE & CABLE CO., 79 SIDNEY ST., CAMBRIDGE 39, MASS.

The best of everything electrical . . . *via* Graybar

PT-66

"Sta-Kon" Insulated Wire Joints

WT-111 M
Hand Installing Tool for All "Sta-kon" Terminals from #22 to #10 wire

Listed by Underwriters' Laboratories, Inc., for both circuit and fixture wiring. Open ends of barrel make visual inspection easy and certain. Holds hundreds of wire combinations up to 3 #12 solid wires. Quickly, easily installed with hand tool. Strong phenolic cap insures permament protection. Vibration-proof; once screwed on, it's there to stay. No taping. No soldering.

PT-70
Barrel without Ears Suitable for Taping

THE THOMAS & BETTS CO.
INCORPORATED
ELIZABETH 1, NEW JERSEY

T&B ENGINEERED

ADEQUATE WIRING THE KEY TO ELECTRICAL LIVING SERVES AND SAVES

T&B PRODUCTS SOLD ONLY THROUGH THE T&B ELECTRICAL WHOLESALER

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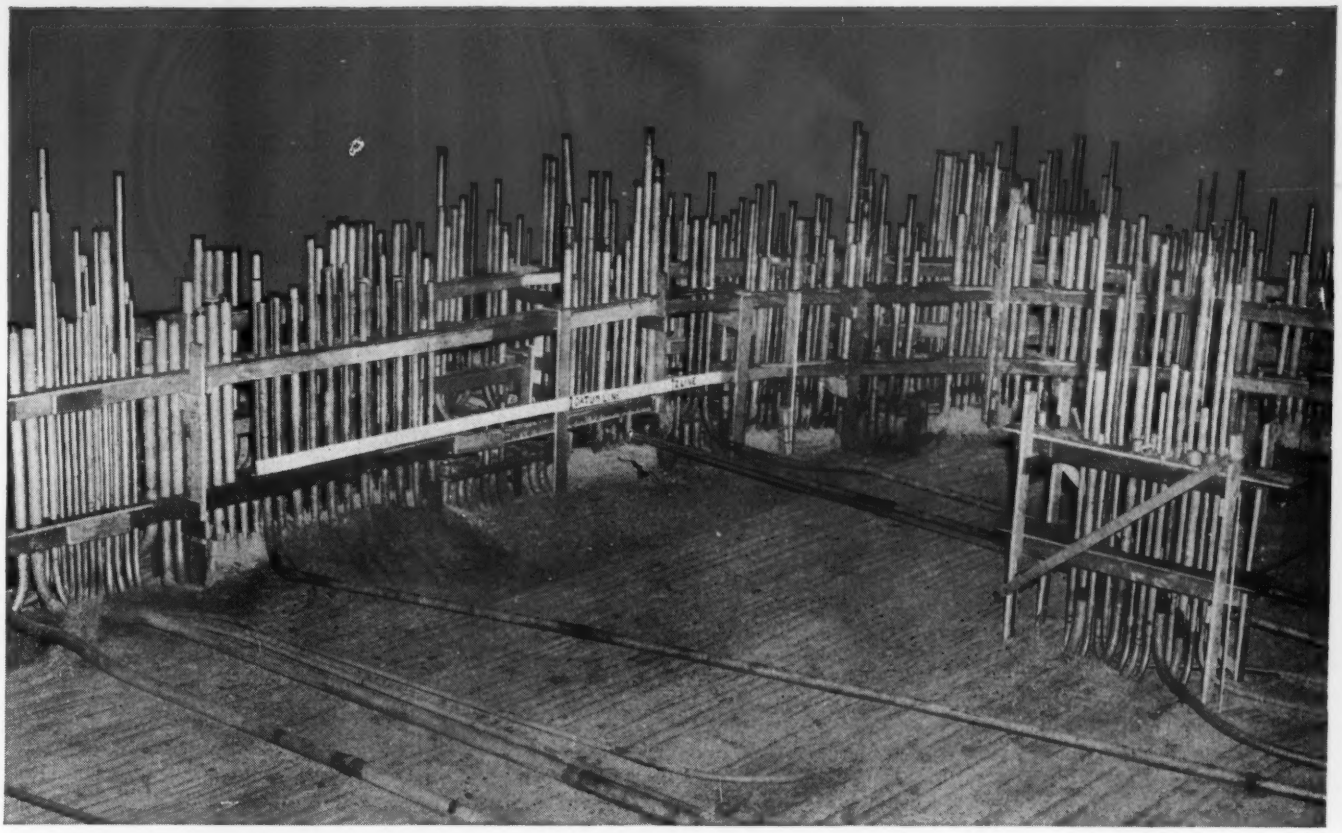


CENTRAL SPANS CONDUIT

Central Rigid Steel Conduit
has been distributed
for many years by
THE GRAYBAR ELECTRIC COMPANY

Assures...

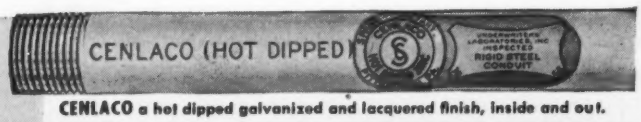
safe wiring systems

For safe wiring systems, include Central Rigid Steel Conduit on every job. You're sure then of conduit of unexcelled quality and of electrical raceways that are approved by the National Electrical Code for every location.

You're also sure of conduit that's easy to cut, bend and thread. And there are three types to choose from . . . *Cenlaco, Central White* and *Central Black,* that make it easy for you to get what you want without delay.

For conduit and other electrical supplies, call your Central Rigid Steel Conduit Distributor . . . and be assured of prompt delivery.

SPANG-CHALFANT
Division of The National Supply Company
General Sales Office: Grant Building, Pittsburgh, Pa.
District Offices and Sales Representatives in Principal Cities



CENLACO a hot dipped galvanized and lacquered finish, inside and out.

CENTRAL WHITE electro-galvanized outside and black enameled inside.

CENTRAL BLACK permanent, baked-on black enamel finish, inside and out.

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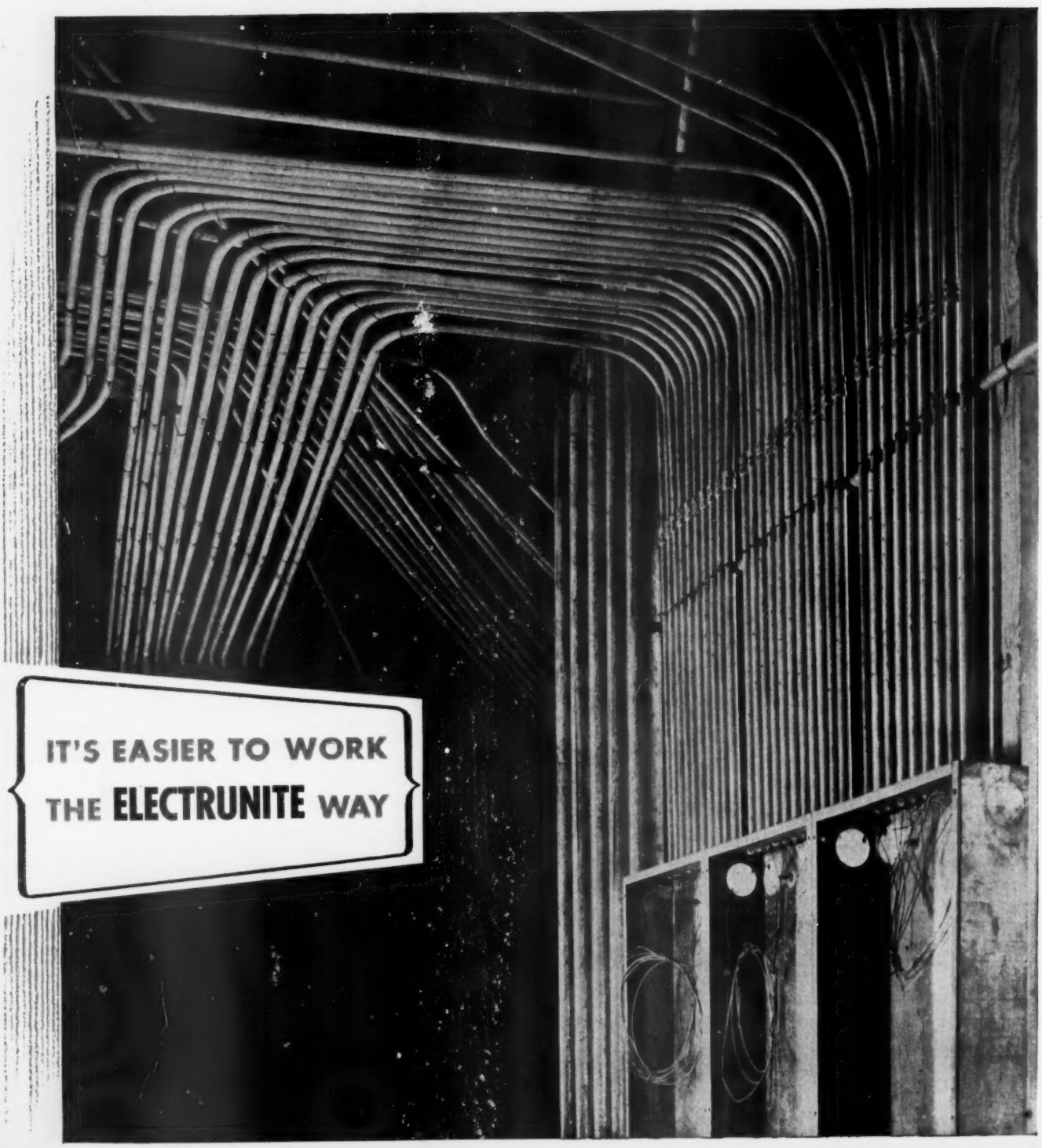
ELECTRUNITE

. . . . . SETS THE STANDARD



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—THE *Original* E.M.T.

FOR MODERN WIRING RACEWAYS

Check these job-proved advantages of ELECTRUNITE E. M. T. *then decide for yourself*

- **NO THREAD-CUTTING . . . Just slip a compression fitting on the tube and tighten with wrench or pliers . . . joints are strong, tight and leak-proof.**
- **EASE OF HANDLING . . . Light weight makes this *modern* raceway easier to install in overhead and hard-to-reach locations . . . makes it easier to bend with predetermined accuracy, too.**
- **INCH-MARKING . . . Imprinting of each length with accurate, easy-to-read inch and foot markings on ½", ¾" and 1" sizes eliminates the need to measure bending and cutting distances with a rule or tape.**
- **KNURLED INSIDE SURFACE . . . This patented feature on ½", ¾" and 1" sizes cuts down friction inside the conduit, making wire-pulling as much as 30% easier than with ordinary raceway materials.**

These are but four of the reasons why more and more contractors are insisting upon Republic ELECTRUNITE E.M.T. for practically all types of wiring jobs—exposed, concealed and *in concrete.*

But that's only part of the story. To get all of the facts about this up-to-date rigid steel raceway that requires no excess-weight metal to act as a base for thread-cutting, see your nearest ELECTRUNITE Distributor. If you do not know his name, write us for it today.

REPUBLIC STEEL CORPORATION
STEEL AND TUBES DIVISION • CLEVELAND 8, OHIO
Export Department: Chrysler Building, New York 17, N. Y.

Three mighty good reasons why Republic ELECTRUNITE E.M.T. takes the headaches out of raceway installations: (1) Inch-Marking—an exclusive ELECTRUNITE feature. (2) Patented one-piece ELECTRUNITE Bender with built-in measurement guides. (3) Bending Instruction Tag which accompanies every shipment of ELECTRUNITE E.M.T.

REPUBLIC STEEL

Republic
ELECTRUNITE E.M.T.

LIGHTWEIGHT THREADLESS RIGID STEEL RACEWAY

The best of everything electrical . . . via GraybaR

CUT Plant Rearrangement Costs

with

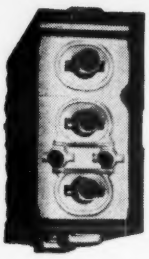
SQUARE D's PLUG-IN DUCT

Production capability of the modern plant is directly related to arrangement of machinery and equipment. Rearrangement may be necessary to take full advantage of an improved process or to permit economical manufacture of a new product.

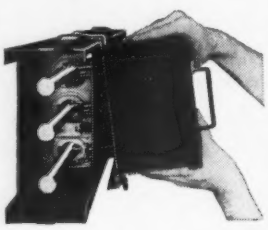
PLUG-IN DUCT can be installed with a minimum of delay and expense near ceilings, along walls, or directly above machinery to provide power where it is needed. It replaces the more conventional panelboards, which have conduit-enclosed feeders, typical of less modern installations.

DUCT EQUIPMENT and other Square D products are distributed by GRAYBAR

GET THESE FEATURES

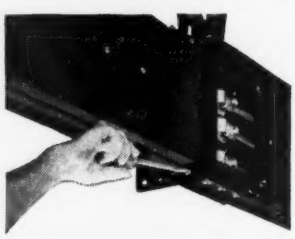


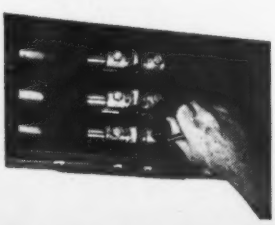
Round Copper Bus Bars provide greater mechanical strength and resistance to short-circuit stresses. Supports are non-carbonizing porcelain.



Plug-in Units of either circuit breaker or fusible switch types are easily installed at 2-foot intervals along both sides of the duct. Plug-in stabs grip the round bus bars with exceptionally high pressure. A hook-type bracket permits rotation of the unit into place. A single clamp screw at bottom holds it there.

Hanger Brackets of heavy gauge steel are two-piece construction to facilitate assembly around duct enclosure. They are suitable for either edgewise or flat mounting of duct structure.





Flexible Connectors of laminated copper join bus bars between sections to provide for expansion and contraction, permit proper alignment and insure tight joints. All bolt heads face outward.

SQUARE D COMPANY

DETROIT · MILWAUKEE · LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.

...the best of everything electrical

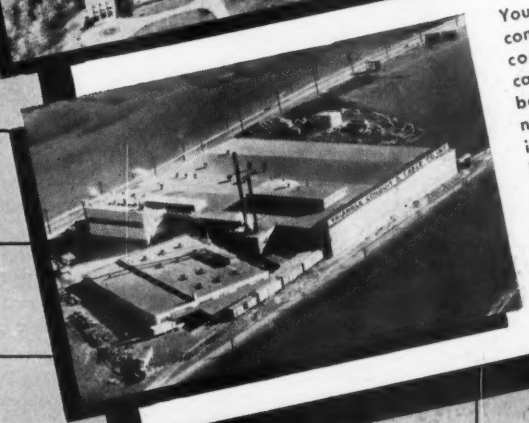
YOU GET REAL VALUE

in

TRIANGLE Conduit...Wire...Cable

Thanks to These *Up-to-the-Minute* PLANT FACILITIES

From wire bar to finished cable — all under one roof. Over 260,000 square feet of floor space in Triangle's modern New Brunswick plant permits integrated operations, undivided responsibility, for every step in the intricate process of making high performance wire and cable.



Your requirements for conduit, flexible steel conduit and armored cable are met faster, better, with Triangle's newly expanded plant in Moundsville, W. Va. Latest advancements in production equipment assure greater output and the uniformly high quality for which Triangle has been famous since 1916.

BARE WIRE

NEOPRENE LINE WIRE-WEATHERPROOF

"TRIOSEAL" THERMOPLASTIC COVERED WIRE

"GLAZON" BUILDING WIRE

LEAD COVERED WIRE AND CABLE

"GLAZON" "TRIEX" NON-METALLIC SHEATHED CABLE

SERVICE ENTRANCE CABLE

VARNISHED CAMBRIC CABLE

"TRIOPRENE" TRENCH CABLE

PARKWAY CABLE

POWER CABLE

SPECIAL CABLE

"TRIOZONE" HIGH VOLTAGE CABLE

"TRISTEEL" RIGID STEEL CONDUIT — HOT DIPPED GALVANIZED

THIN WALL CONDUIT — HOT DIPPED GALVANIZED

ARMORED CABLE—HOT DIPPED GALVANIZED

FLEXIBLE CONDUIT — HOT DIPPED GALVANIZED

for Jobs that **MUST *BE RIGHT,* *Specify* TRIANGLE**

For *Extra* quality — at NO Extra cost — *insist on* **TRIANGLE!**

If It Bears this Trade Mark *It's Made by Triangle*

If It's Made by Triangle — IT MUST BE RIGHT!

ARTERIES FOR ELECTRICAL INCORPORATED SYSTEMS

TRIANGLE CONDUIT & CABLE CO., INC.

1908 JERSEY AVENUE • NEW BRUNSWICK, N. J.

FACTORIES: New Brunswick, N. J. • Moundsville, W. Va.

IT MUST BE RIGHT!

"GLAZON" BUILDING WIRE • BARE WIRE • ARMORED CABLE • "GLAZON" TRIEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE, SERVICE DROP, VARNISHED CAMBRIC BRAIDED OR LEADED, TRIOPRENE TRENCH, POWER AND PARKWAY CABLES • RIGID CONDUIT HOT-DIPPED GALVANIZED • ELECTRIC METALLIC THIN WALL CONDUIT • FLEXIBLE STEEL CONDUIT

The best of everything electrical... *via* GraybaR

THERE'S

No Extra Charge

FOR THESE EXTRAS WHEN YOU BUY . . .

Wakefield®

NO EXTRA CHARGE
FOR 14 TO 20 GAUGE STEEL PARTS

NO EXTRA CHARGE
FOR FULLY COMPENSATED BALLASTS

When you buy or specify Wakefield, you pay nothing extra for all the extra quality and extra features that are built into Wakefield equipment. You pay nothing extra for the fact that the Grenadier II four-foot unit can be washed in 1/3 to 1/2 the time required for the average four-foot unit. You pay nothing extra for the fact that the Plaskon reflectors on the Star slide in and out like drawers. You pay nothing extra for the fact that you can relamp through the top, side or bottom of the Grenadier II and IV. And so on—extra by extra. It just naturally pays to buy Wakefield because you don't have to pay for the extras.

The F. W. Wakefield Brass Company, Vermilion, Ohio

NO EXTRA CHARGE
FOR CHEMICALLY PLATED UNDERCOAT TO INHIBIT RUST

NO EXTRA CHARGE
FOR TIME SAVING MAINTENANCE FEATURES

NO EXTRA CHARGE
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NO EXTRA CHARGE
FOR ONE-MAN HANGING EASE

Wakefield Over-ALL Lighting

FOR OFFICE • DRAFTING ROOM • STORE AND SCHOOL

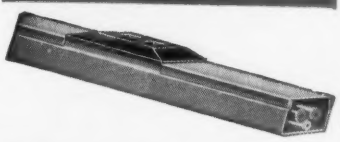
GraybaR Distributed by GraybaR ELECTRIC COMPANY

See Your Graybar House

. . . the best of everything electrical

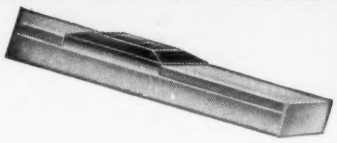
You can PLUGMOLD this room by 3 methods

unwired PLUGMOLD



Provides complete flexibility. Wiring is done on the job . . . outlets may be placed where needed . . . easily added or relocated. *Approved with devices* in place for three No. 12 or No. 14 conductors.

wired PLUGMOLD



Factory-wired, ready to install. Available in 3-foot lengths, 6 outlets on 6-inch centers . . . 6-foot lengths, 4 outlets on 18-inch centers.

SNAPICOIL

Outlet convenience by the yard! Coils of prewired receptacles, ready for quick installation. Available in four popular lengths, with brown or ivory receptacles.

When you plan electrical outlet convenience — in homes, offices and stores — look into the time-saving, business-building opportunities of the PLUGMOLD *trio*.

Interconnectable, three PLUGMOLD wiring methods are available with a wide range of factory-wired outlet spacings (or wiring may be done on the job, outlets placed exactly where needed) . . . *flexibility* to meet the specific requirements of every installation. A minimum number of well-designed fittings means savings in time and trouble.

And regardless of the PLUGMOLD method you select, you're assured of the same results . . . an installation that's neat, trim in appearance . . . outlet convenience that always has customer approval.

Important *reasons why* it will pay you to plan PLUGMOLD. For the complete facts, write today . . .

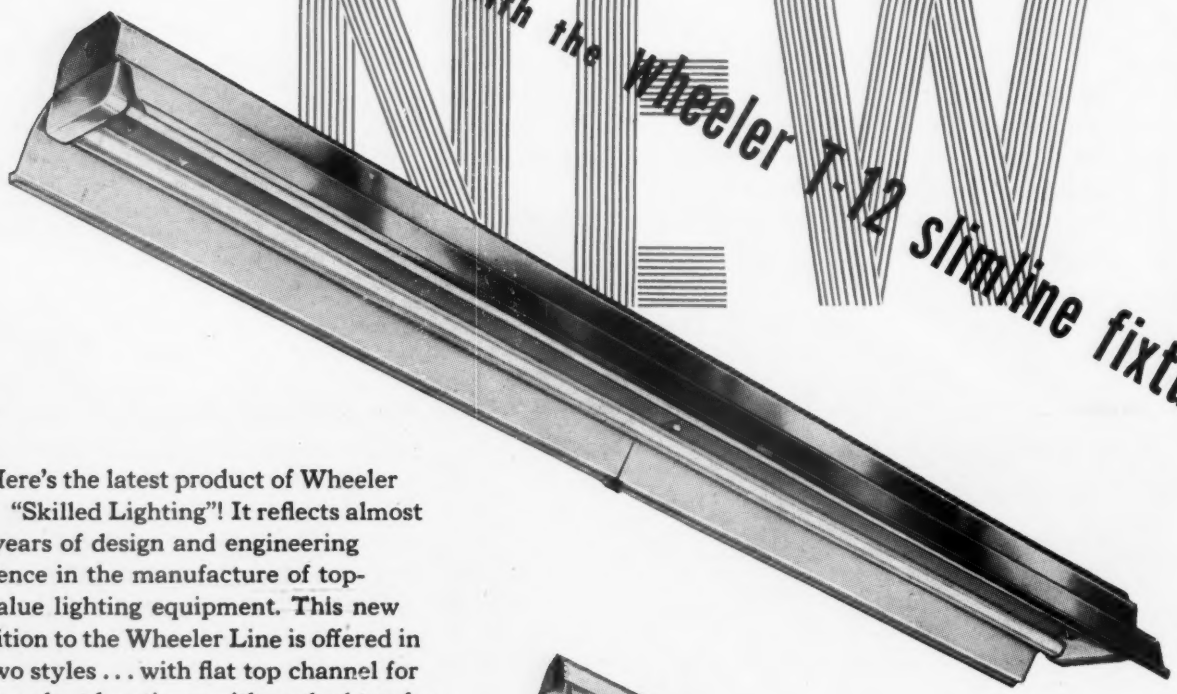
THE WIREMOLD COMPANY
HARTFORD 10, CONN.

The best of everything electrical . . . *via* GraybaR

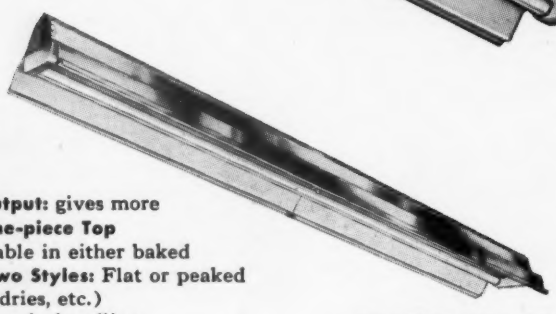
modernize your plant lighting with the

NEW

Wheeler T-12 slimline fixture



Here's the latest product of Wheeler "Skilled Lighting"! It reflects almost 70 years of design and engineering experience in the manufacture of top-value lighting equipment. This new addition to the Wheeler Line is offered in two styles . . . with flat top channel for ordinary plant locations; with peaked top for locations where excessive moisture and dust-laden air conditions exist.



PEAKED TOP MODEL

6 Better-Value Features **1. High Output:** gives more light per foot of lamp length. **2. One-piece Top Channels:** made of heavy gage steel. Available in either baked enamel or vitreous porcelain enamel finish. **3. Two Styles:** Flat or peaked top channels (the latter for textile mills, foundries, etc.) **4. Reflectors in Sections:** for greater ease in handling, each unit furnished with two open-end-type porcelain enamel reflectors. **5. Individual or Continuous Mounting. 6. Latest G.E. Twin-Turret Type Lampholders** (depressable): for single pin contact, making lamp insertion and removal simple.

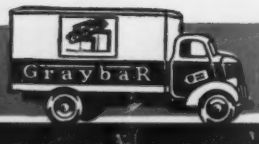
The new T-12 Slimline Unit is designed for use with two 75 watt, 96" T-12 Slimline single pin lamps (instant starting) operating at 425 MA. Send for complete details of this new "Skilled Lighting" fixture built to stay new-looking for years. *Wheeler Reflector Company, 275 Congress St., Boston 10, Mass.* Also New York, N. Y. Representatives in principal cities.

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

Wheeler REFLECTORS

SKILLED LIGHTING

MADE BY SPECIALISTS IN LIGHTING EQUIPMENT SINCE 1881



. . . the best of everything electrical

FOR SAFETY'S SAKE . . . USE CONDUIT *(Full Weight Rigid Steel)*

You never go wrong on rigid steel conduit

THE heavy steel walls of rigid conduit afford sure protection to wiring. Encased in steel, cables are safely shielded during construction and for the entire life of the building. When installation of floors is long-delayed, rigid conduit protects the system, free from harm by wheelbarrows and trucks of careless workmen, safe from thoughtless acts of intruders, undamaged by moisture or fire or dust. Check with your distributor for the availability of Youngstown Buckeye or Youngstown EMT.

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steel

General Offices — Youngstown 1, Ohio

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CONDUIT · PIPE AND TUBULAR PRODUCTS · BARS · RODS · COLD FINISHED CARBON AND ALLOY BARS · SHEETS · PLATES · WIRE · ELECTROLYTIC TIN PLATE · COKE TIN PLATE · TIE PLATES AND SPIKES.

The best of everything electrical . . . *via* GraybaR

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CALIFORNIA
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COLORADO
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New Haven

DELAWARE
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NEW HAMPSHIRE
Manchester

NEW JERSEY
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OKLAHOMA
Oklahoma City
Tulsa

OREGON
Eugene
Portland

PENNSYLVANIA
Allentown
Harrisburg
Philadelphia
Pittsburgh
Reading

RHODE ISLAND
Providence

SOUTH CAROLINA
Columbia

SOUTH DAKOTA
Aberdeen

TENNESSEE
Bristol
Chattanooga
Knoxville
Memphis
Nashville

TEXAS
Amarillo
Austin
Beaumont
Corpus Christi
Dallas
Ft. Worth
Houston
San Antonio

UTAH
Salt Lake City

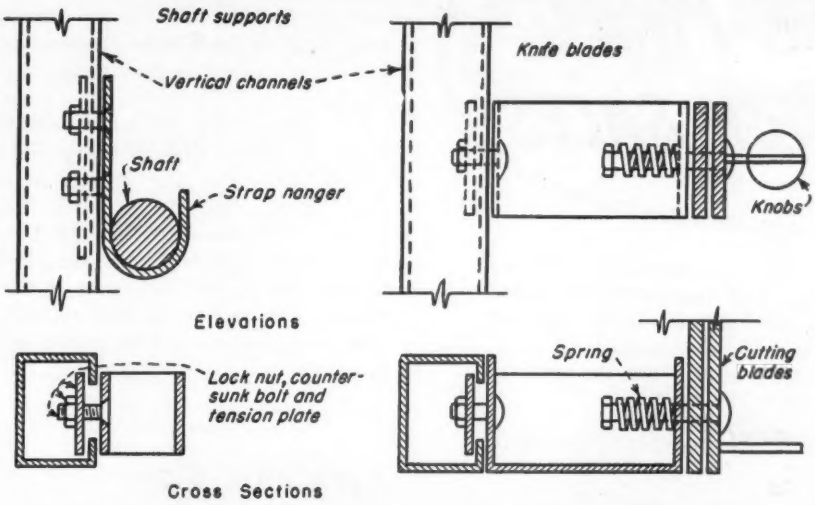
VIRGINIA
Norfolk
Richmond
Roanoke

WASHINGTON
Seattle
Spokane
Tacoma

WEST VIRGINIA
Charleston

WISCONSIN
Milwaukee

Motor Shops



Shaft supports and knife blades are supported on vertical channels by means of lock nuts, countersunk bolts and tension plates positioned inside the channels. Blades are separated by pulling knobs and blades snap together by spring action when these knobs are released.

Paper Rack Makes Straight Edges

Insulating papers, purchased in 3-foot long rolls, is stored neatly in the storeroom of the J. L. Hemphill Company, North Bergen, N. J., on an easily-constructed space-saving vertical rack which holds eight rolls of paper yet occupies less than 3 square feet of floor space. The main vertical members of the rack are formed of steel channels and supporting hooks for the roller shafts are made from strap steel. Hooks are adjustable and may be secured at any desired elevation along the channels by tightening the bolts which pass through the straps and also through tension plates placed inside the lips of the channels. As bolts are tightened, the tension plates are drawn inwards and the channel lips are securely grasped between the straps and plates.

About waist high, two cutting bars are also mounted on the vertical frame, held in position by short sections of wider channel stock. These wider channels are held in place by the same method formerly explained. The cutter blades are held together by means of spring action, with the springs coiling around the shank of the holding bolts. Auxiliary knobs at the ends of the outer blade make it possible for the storeroom keeper, Jack Herman, to easily pull this blade forward a few inches.

In operation, the paper to be used is unrolled and passed between the cutting blades. As soon as the pulling knobs on the outer blade are released, the spring tension snaps the blades together and the paper can be ripped quickly and accurately at a right angle.

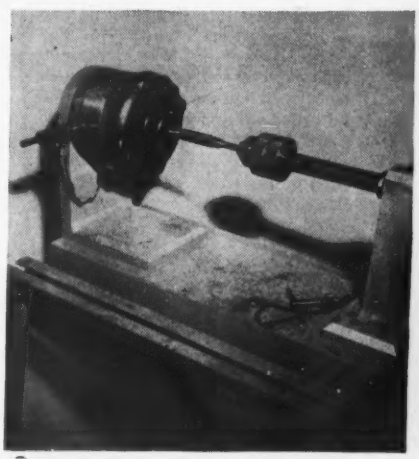
Insulation paper is slipped between blades of cutting bars and ripped in a straight line. Compact rack occupies little floor space yet holds eight full-sized paper rolls in storeroom of J. L. Hemphill, North Bergen, N. Y.

Line Reamer for Small Motor Bearings

Just in front of the assembly bench and within easy reach of the mechanic in the small motor department of Barker-Fowler Electric Co., Lansing, Mich., is a hand-operated line reamer for small motor bearings. It can take reamers up to 29/32-inch size and can be used on motors up to ¾-hp.

Designed and built in the Barker-Fowler shop, the reamer is mounted to a pipe frame table 32 inches high, 36 inches long and 15 inches wide. Base of the assembly is a 38-inch length of 8-inch channel with closed ends. Two 8-inch metal posts (1¾-inch solid steel stock) are welded to the channel base and support a 1-inch diameter reamer shaft in standard sleeve bearings. At one end of the shaft is a 7½-inch diameter hand wheel; at the other end, a No. 14, ½-inch Jacobs chuck to hold the reamers. At the opposite end of the assembly, an end plate of 1-inch steel supports a self-centering

Hand-operated line reamer designed and built for small motor work in the Barker-Fowler Electric Co. shop at Lansing, Michigan.



Close-up of self-centering lathe chuck holding motor end bell and shaft chuck holding reamer. Note shaft post with standard sleeve bearing.

CONTRACTORS:

MAKE EASY EXTRA PROFITS FROM TIMESWITCH SALES

GENERAL ELECTRIC TIME SWITCHES **are easy to sell as "extra-profit" items along with most of your regular jobs. Wherever an electric circuit needs to be turned on and off repetitively, there's an opportunity for you to make a sale. Customers appreciate the convenience, economy, and safety of G-E time switch control.**

HAVE YOU CONSIDERED THESE POSSIBILITIES—AND POINTED THEM OUT TO YOUR CUSTOMERS?

G-E Time Switches for . . .

Store window lighting
Electric sign control
Refrigeration defrosting
Electric appliance control
Apartment hall lighting
Factory yard lighting
Heater and cooling control
Public building lights
Conveyor, fan, solder-pot, or oven control in factories

There's a G-E time switch for each of these jobs, and others that may tie right in with construction you're doing now.

Type T-47 Handy Time Switch is best for single on-off operations. It repeats a cycle (minimum on 5 min., maximum 22 hrs.) every 24 hours. Only $10.98 list.

Type T-27 is the "complete" time switch. It's easily adjusted for any daily schedule, even a constantly changing dawn-dusk arrangement (with astronomic dial). It also can be furnished with an omitting device to make it skip certain days. Prices are from $25.50 list. Both switches have large silver contacts and reliable Telechron® motors.

EASY INSTALLATION—**Roomy wiring space, simple knockouts, and a mechanism that need not be removed from the case helps simplify your installation job.**

Start adding this easy, extra profit to your regular jobs. Get a supply of G-E time switches from your nearest distributor. If you want more details, write for Bulletin GEA-3339 (T-27) and GEA-4874 (T-47). *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

603-80

lathe chuck which holds the motor end bells.

The reamer shaft has an 11-inch travel—back and forward. An adjustable set-screw "stop" collar between the two shaft posts can be set to regulate the depth of ream in the bearing. End bells up to 8-inch diameter can be held in the self-centering stationary chuck.

To operate, the mechanic sets the motor end bell in the stationary chuck; inserts the proper size reamer in the shaft chuck; sets the stop collar for proper shaft travel; turns the handwheel while applying horizontal force to the shaft until the ream is completed. The reamer is then retracted. The net result is a perfect line-reamed bearing.

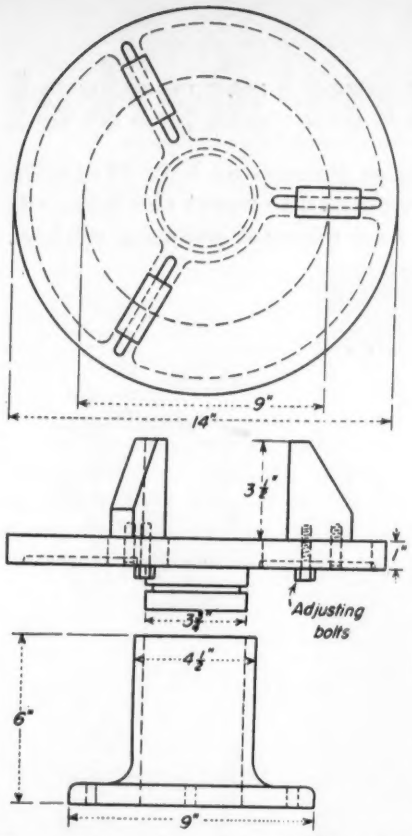
Turntable Vise Holds Stators

Many motor repair shops use the air chisel to cut coil ends on stators prior to burning the insulation for removing old coils. Some hold the stator in a conventional vise; others anchor it to a stripping table. Either of these methods requires the mechanic to work around the stator as he cuts the coils.

At the Mielke Electric Works, Inc., Duluth, Minn., the man stands in one position and turns the work as he cuts. This approach is possible through the use of a turntable vise designed by Warren Mielke who has applied for a patent on his device. The idea was submitted as an entry in the 1948 NISA Award Contest and is released for publication through the courtesy of the 1948 NISA Award Contest Committee.

The turntable consists of a 14-inch diameter disk cut from a 1-inch thick steel plate and slotted at three radii (120 degree points) to accommodate

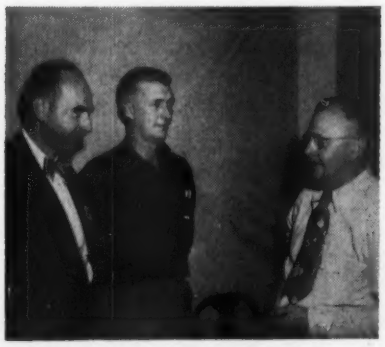
Triple-jaw turntable vise holds stators securely while coil ends are cut.



Construction view of turntable stator vise.

three vise jaws. Each triangular-shaped jaw is 3½ inches high; about 2½ inches wide at the base; and made of 1-inch steel stock. Jaws are adjustable for stators ranging from 4-inch to 9-inch diameters; are held in position by a locking bolt on the underside of the turntable.

The turntable assembly rests about six inches above the bench top on a 4½-inch diameter collar with a 9-inch diameter base flange. Cutting time has dropped at the Mielke shop since this vise was developed. It is easy to use and requires only three bolt adjustments to clamp or unclamp stators.



ASKING THE AUTHOR ***Ray Ashley (right) about his new book "Electrical Estimating" are contractors Eugene Scott, West Frankfort, Ill., and E. M. Swam, Decatur, Illinois.***

READY
In a Jiffy
TO THREAD
1" to 2" PIPE

RIDGID No. 65R gives real precision threads—quickly and easily

● In just 10 seconds you're ready to cut fast, accurate threads on 1," 1¼," 1½" and 2" pipe. Workholder sets instantly—only one screw to tighten, no bushings. The 65R has no extra dies for you to bother with; one set of high-speed steel chaser dies does the trick on iron, steel, brass or copper pipe or conduit. Buy work-saver 65Rs from your Supply House.

RIDGID
WORK-SAVER PIPE TOOLS
THE RIDGE TOOL CO. • ELYRIA, OHIO

sell RoBarn to the farm market

The original and superior Neoprene Non-Metallic Sheathed Cable . . . developed to meet the hazardous conditions of farm and general purpose wiring.

- **Resists flame, moisture, ammonia fumes, uric acid and physical abuse • It cannot rot, mold or oxidize.**
- **It is handy to use . . . strips quickly, easy to connect.**

RoBarn is a "hot" sales item right now because it answers so many needs on the farm and elsewhere. This is the first cable to be approved for wiring on farm buildings in one of the nation's leading rural areas.

RoBarn answers a long felt need for a wiring material that resists moisture, ammonia fumes, extreme temperature changes, humidity, acids, rot and oxidation. That's why it is in such demand today, not only from the farm market but for general purpose wiring where severe conditions exist.

This quality product is Underwriters' approved as Non-Metallic Sheathed Cable having "adequate fungus resistant and other necessary properties for use in cow barns and *other locations where it would be subject to conditions of heat, cold, moisture, corrosive fumes and fungus.*"

The National Electrical Code, Article 336, indicates many other general purpose uses for RoBarn. This is the cable you can sell now . . . and with confidence.

It Costs Less to Buy the Best...
Buy RoBarn

ROME CABLE
Corporation
ROME • NEW YORK
From Bar to Finished Wire

ROME CABLE ROME, N.Y.

Practical Methods

FORM 3

Date

Name

Address

Job

Mechanic	Started	Finished	Total Hours

.....ft. top service

.....ft. circuit run .....3' .....6' range cord

.....circuit from ODC .....extra ODC

.....circuit from cust. switch .....loops closed

.....extra reconnect .....O.H.L. required

CABLE

..... No. 6-3 S. E. Cable
..... No. 6-3 S. E. Cable
..... No. 8-2 S. E. Cable
..... No. 8-3 S. E. Cable
..... No. 10-2 S. E. Cable
..... No. 10-3 S. E. Cable
..... No. 12-3 Romex Cable
..... No. 12-4 Romex Cable
..... No. 12-3 S. E. W. H. Cable

INSULATED and BARE WIRE

..... No. 4 ..... No. 6 Type "T"
..... No. 4 ..... No. 6 R. C. Wire
..... No. 8 ..... No. 10 R. C.
..... No. 12 ..... No. 14 R. C.
..... No. 4 ..... No. 6 Bare
..... No. 8 Bare

CONDUITS and FITTINGS

..... ½ ..... ¾ T. W. Conduit
..... 1 ..... 1¼ T. W. Conduit
..... ½ ..... ⅜ ..... 1 T.W. conn.
..... ½ ..... ¾ ..... 1 T.W. coup.
..... 1¼ T.W. conn. ..... T.W. coup.
..... H.W. Threadless conn.
..... ¾ ..... ½ Serv. L.B.
..... 1½ ..... 1 Serv. L.B.
..... 1½ ..... ¾ ..... 1 ..... 1¼ Serv. cap.
..... ½ ..... ⅜ Greenfield
..... ½ ..... ¾ Gra. conn.
..... ½ ..... ½ Gra. conn. 90°
..... ½ ..... ¾ Tomic conn.
..... ½ Romex connector
..... 2-Hole flat strap

..... ½ 1-hole ..... ½ 2-hole
..... ¾ 1-hole ..... ¾ 2-hole
..... 1 1-hole 1 2-hole
..... ½ ..... ⅜ ..... 1 locknuts
..... ½ ..... ¾ ..... 1 bushings

SWITCHES and BREAKERS

..... 60 A. range switch
..... 30 A. 3-pole Safety
..... 30 A. 2-pole Safety
..... 25 A. D.P. Breaker
..... 30 A. S.B. Porc. Block
..... 30 A. D.P. Porc. Block
..... 30 A. Combination switch
..... Range Receptacle
..... Single ..... DBL ODC
..... Y Box

MISCELLANEOUS

..... 1¼ to 1 ..... 1 to ½
..... ¾ to ½ Red. Washer
..... 1¼ to 1 Red. Bushing
..... ½ Gas Plug ..... Gas Cap
..... ½ close nipple
..... ½ x 2 ..... ¾ x 3
..... 10/24 A & JS bolts
..... 14/20 A & JS bolts
..... Strap ground clamp
..... Service ground clamp
..... 35 A. fuses
..... 60 A. fuses
..... 4 Oct. Box and Cover
..... 4 Sq. Box and Cover
..... 30 A. ..... 60 A. Solderless lugs
..... 74B ..... 76B wirenuts
..... Wood screws

Job ticket form developed by Reid Electric Company simplifies material and labor records for each job. Face of single-sheet form is shown on left; detailed listing on back of form shown on right.

Quick-Entry Job Cost Forms

COST CONTROL

Every electrical contractor knows, or should know, the value of accurate job costing methods, particularly on smaller jobs of the residential type where competition is exceptionally keen. Too frequently, estimates are completed by adding a "miscellaneous" item, picked out of the air, to cover odd and sundry small material and labor items that should be definitely known. Depending upon the magnitude of his guess, the contractor may lose the job and regret it; or get the job and equally regret his good fortune.

Granted it is rather difficult to secure accurate accountings of all materials used on a job. Contribute say a dollar's worth of miscellaneous items to a job and forget about it. That may be permissible once in a while. But in a business activity like that of Reid Electric Company, range wiring specialist of Highland Park, Michigan, it becomes a serious item. For, Reid's annual volume is comprised of some 6,000 or more small jobs (range, water heater, clothes dryers, etc.). Multiply this by the value of the "forgotten" material items and you get a sizeable sum.

Reid's owner-manager, E. E. Herndon, realized that the most accurate tabulation could be made on the job, immediately after completion while quantities were still fresh in the minds of the electricians. To simplify this chore and save time, Herndon uses a printed order form which the electrician receives each morning before he starts his rounds.

The face of the form (see Fig. 1) has the date, name and address of customer and job description filled in before departure. After the job is finished, the electrician adds the other requisite data which provides a quick comparison of labor hours with the general physical size of the job.

The back of the form has a complete printed listing of all material items that may have been used in this type of installation. Comprehensive listings are divided into five categories; Cable; insulated and bare wire; conduit and fittings; switches and breakers; and miscellaneous items (bushings, bolts, fuses, etc.). The electrician needs to insert only quantities used in the proper listing and his report is complete.

Turned in to the office at the end of each day, these job tickets form the basis of accurate cost records. Labor and material items are transferred to individual job costing sheets where unit prices and extensions are made and totaled.

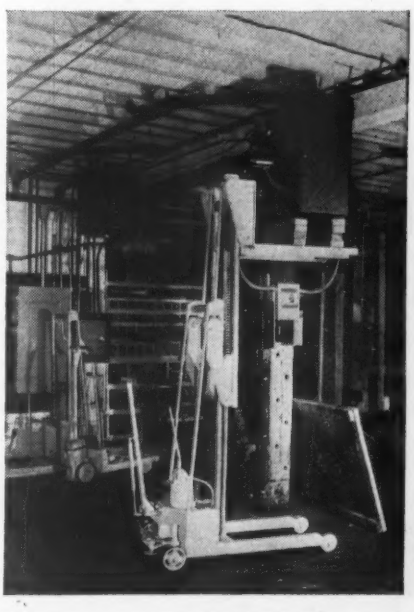
Job ticket material totals for each service truck provide a good check on the quantity of materials needed to replenish supplies each morning.

Fork Truck Is Maintenance Tool

MAINTENANCE

The versatility of industrial trucks, fork lifts, mobile platforms and motorized ladders is being widely recognized and appreciated by industrial maintenance men who are faced with problems of high-bay construction, multiple-tiered stock areas, unusual mounting heights of lighting fixtures and positioning of electrical equipment in hard-to-reach locations.

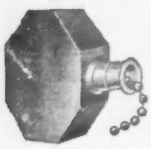
Even in moderate-height ceiling areas, telescopic hydraulic high lift trucks can be utilized for installing heavy overhead fixtures or equipment similar to the unit heaters shown in this illustration. This truck, manufactured by the Lyon-Raymond Corporation of Greene, N. Y., has a platform area of 2– by 2½ feet and has an elevation range of from 6-inches to 7 feet. Elevation is regulated by a simple hydraulic hand pump which can be operated with minimum effort. With ball-bearing wheel both front and back, the truck is easily adjusted into exact position and a floor lock firmly anchors the truck after it has been placed in its desired location. Lightness is combined with strength due to tubular and formed-plate construction. Fork trucks have lifts to 9 feet.

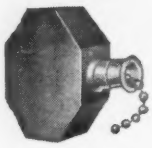


Telescopic, hydraulic high-lift truck lifts heavy unit heater into position for installation and can be utilized by maintenance men for raising equipment or as a readily-adjustable working platform.

ONE McGILL model 41 Levolier switch

OUTLASTS 2 ORDINARY SWITCHES





SMALL—Only ⅝" x 1⅜"
POWERFUL—6 amp. 125 Volt
—3 amp. 250 Volt
DEPENDABLE — Underwriter's lab "T" rating. Unusual endurance. Standard switches to exceed underwriters' 6,000 cycle requirements five times.

QUALITY COSTS YOU LESS when you buy Levolier switches. Each of the twenty-six parts is precision built like a fine watch, carefully inspected, for utmost dependability . . . your guarantee of years of trouble-free service.

MULTIPLE USES because of its small size, "T" rated 6 amp. 250 V. capacity, make it ideally suited for use in canopy mountings, for incandescent and fluorescent lighting and for fractional HP motor control.

ONLY McGILL MAKES *Levolier* **SWITCHES** with the patented universal lever action. Push or pull in any direction . . . they work . . . giving economical, current saving, individual control. Here is what users say:

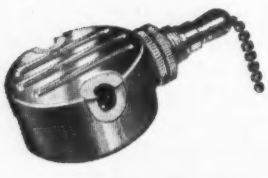
" . . . have installed 10,000 model 41's since 1943. There hasn't been a failure in any of these."

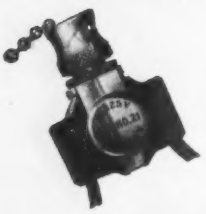
"I sell model 41 switches for fixtures with a promise of replacing if it does not last up to 5 years."

* *Name on request*

No. 25
6 amp. 125 V.
Toggle Switch
Single Pole
"T" Rated

No. 1010
10 amp.
125 Volt
"T" Rated





No. 21
3 amp. 125 V.
Pull Switch
Single Pole

No. 265
6 amp. 125 V.
Double Pole
Double Throw

"AVAILABLE FROM YOUR ELECTRICAL WHOLESALER"

For Catalog 43 write: McGill Manufacturing Co. Inc., 450 N. Campbell Street Valparaiso, Indiana

McGILL
TRADE MARK
electrical specialties

ONLY McGILL MAKES *Levolier* SWITCHES

Fixture Fashioned From Wiring Devices

WIRING

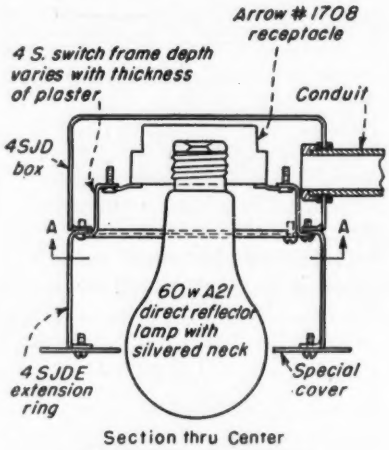
An electrical contractor's biggest sales point is his construction know-how and engineering ability. Frequently he is in a position to solve problems that trouble architects and others who are not so closely associated with electrical construction techniques and practices.

Such was the experience of the S. C. Sachs Co., Inc., electrical contractors and engineers of St. Louis, Mo. They worked very closely with the owners, architects and consulting engineers on the electrical system at the new ultra-modern administration building of the American Stove Company in St. Louis. One of the problems solved by Sachs engineers was that of suitable fixture to be installed in the building entrance.

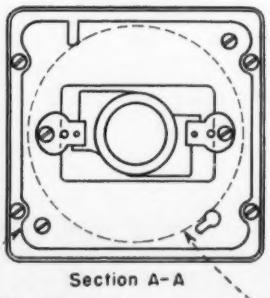
The architects wanted a type of fixture, suitable for flush mounting, that would expose only the bottom half of an incandescent lamp bulb.

Sachs engineers pondered the problem and came up with a design that incorporated conventional wiring accessories, provided an inexpensive fixture that produced the desired effect.

Two common outlet accessories comprise the body of the fixture—a standard 4SJD box with a 4SJDE ex-



Section thru Center



Section A-A

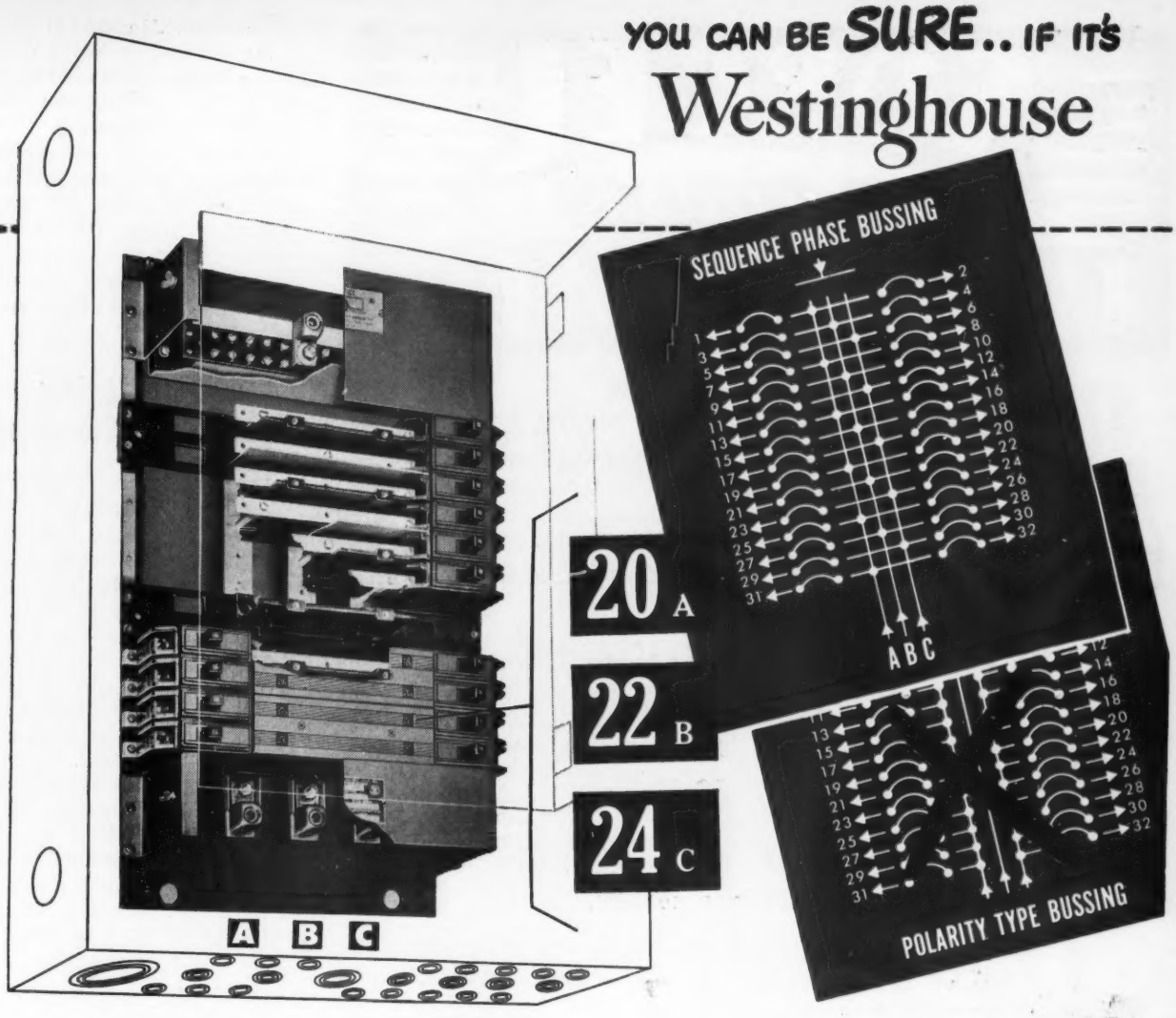
Switch frame ground to clear screws

Edge of hole in extension ring

Outlet box accessories combine with silvered neck lamp to provide special flush entry fixture. Construction details illustrate design of inexpensive unit.

YOU CAN BE **SURE**.. IF IT'S

Westinghouse



HOOKS UP "easy as A-B-C!"

Here is a new feature of all Westinghouse 3-phase, 4-wire Lighting Panelboards which cuts installation time and makes inspection easier. Each circuit, and the main bus to which it is attached, is clearly identified by the letters A, B or C.

This easy identification is made possible by the sequence phasing method of bussing which is now standard on all of these Westinghouse Lighting Panelboards. Gone is the old polarity-type bussing —the time-consuming "ringing-out" of circuits is eliminated. What's more, this feature that speeds up the hookup is but one of many *extra* details of construction that is standard on all Westinghouse Lighting Panelboards.

To provide local panelboard service in your area, 13 Westinghouse Panelboard Assembly Shops are pin-pointed throughout the country. To get the complete story on Westinghouse Engineered Panelboards, and their moneysaving "extras", contact the Westinghouse Office nearest your phone. Or write for Descriptive Bulletin 30-930 to Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

J-40378

Westinghouse

PANELBOARDS

SORGEL AIR-COOLED TRANSFORMERS

Reduce Costs

Easy to install Wall or floor mounting. No extra brackets needed.

Built-in connection compartment with convenient knock-outs.

Solderless terminals No soldering, no taping, no splicing.

Reduce feeder sizes with high voltage distribution and air-cooled transformers at load centers.

100 Kv-a Single Phase. Floor Mounting Type.

¼ Kv-a. Single Phase. 460/230 to 115 volt.

15 Kv-a. 3-phase. Wall mounting type. Showing connection compartment with solderless terminals.

Sizes ¼ to 2000 Kv-a. All voltages, 115 to 15,000 volts

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 836 W. National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled transformers

tension ring. Mounted at the junction of the box and extension ring is a 4S switch frame (normally used to mount switches flush with plaster line) which supports an Arrow No. 1708 screw-shell receptacle. A special trim cover screwed to the bottom of the extension ring completes the unit. A 60-watt, A21 direct reflector lamp with silvered neck screws into the receptacle socket. Only the bottom half of the bulb is exposed to view.

Radiant Heating Tested by Electronics

WIRING

To insure a leakproof condition in the radiant heating system recently installed in the home of W. E. Herrmann, Schenectady, N. Y., the system was checked prior to use with a General Electric electronic Type H leak detector. This instrument is so sensitive to the presence of halogens—such as chlorine, fluorine, bromine and iodine—that even pinpoint leaks are instantly located. In making the test, freon gas (a halogen compound) was introduced into the 1800 feet of ½-inch copper tubing which was installed on the unfinished ceiling of the home. The tip of the detector was then passed slowly through the air surrounding the tubing and the presence of the gas was noted on the dial of the electronic unit. Approximately 100 joints in the tubing were tested in this manner in less than two hours and three leaks, so small as to have remained undetected by two different previous tests, were located immediately. The importance of this positive

Electronic leak detector, sensitive to halogens such as freon gas, is used to trace leaks in radiant heating installation in residential area. Presence of gas is indicated on dial, making detection positive and accurate.

Safest...Easiest...Coolest!

New Federal Noark Front-Operated Safety Switch

ANY WAY YOU LOOK AT IT, the new Federal Noark Front-Operated Safety Switch is absolutely your one best buy. It's the *safest* safety switch . . . the easiest switch to install and to maintain . . . the coolest in operation.

To assure cool operation, there are only two joints to each pole, and steel springs hold them under extreme tension. What's more, it has an ingenious one-piece fuse terminal and lug construction . . . a patented high pressure fuse holder.

For utmost safety, operating cross bar *beneath* blades guarantees current break . . . visible blade construction . . . 3-position handle . . . tamper-proof cover . . . instantaneous arc extinguishers.

New Federal Noark Front-Operated Safety Switches come in 30,60, and 100 amp. capacities, for 230-volt A.C.—250-volt D. C. and 575-volt A. C.—600-volt D. C. Order them from your distributor for superior service and economy right now. And ask us for detailed literature. Federal Electric Products Company, 50 Paris Street, Newark 5, New Jersey.

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FEDERAL NOARK

FRONT-OPERATED SAFETY SWITCH

Complete line of Federal Electric Products includes Motor Controls, Safety Switches, Service Equipment, Circuit Breakers, Panelboards, Switchboards, Control Centers, Bus Duct ★ Sales Offices in principal cities.

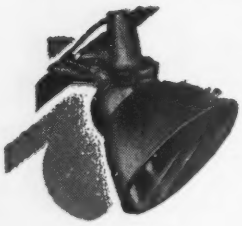
Sportslighting . . . an Opportunity for Contractors

This is Witter Field of Piedmont high school, California. Installed by Abbet Electric of Oakland, it is another example of the increasing number of floodlighting jobs worth going after.

Installation was simple—planned, ordered and executed as a standard G.E. "144" lighting system—according to "the book."

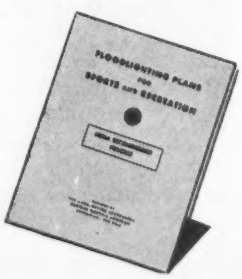
This book specifies everything to assure a perfect lighting job—from the exact location of the six 80-foot steel poles to the aiming of the 144 L-69 floodlights.

Floodlighting installations like this are going in all over the country—in ever increasing numbers. There are seventeen others at high schools near Piedmont—all recently installed, and using G-E floodlights. Municipalities and industrial plants, as well as schools, are all prime markets. Installations can be handled by any competent contractor, even without previous lighting experience. They should yield a satisfactory profit—and frequently the contractor obtains, with the initial installation, a year-after-year maintenance contract. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*



FREE PLANS AVAILABLE—This is "the book" that contains 38 complete floodlighting plans for sports and recreation. One is the "144" lighting system used at Witter Field—144 G-E floodlights on 6 80-foot steel poles—complete with a list of all material required down to concrete and paint. Among other plans are tennis courts, volley ball and 12- to 48-lamp softball fields. Ask for it as GET-1284.

THE SPORTS-LIGHT—This is the floodlight used at Witter Field—G.E.'s L-69. It gives more light per unit, more light per watt, is easier to install and cheaper to maintain than any other comparable unit. It's so good that four major-league parks use it, so economical that it's the favorite for sandlot softball. Bulletin GEA-4835 gives complete description and prices.



GENERAL ELECTRIC

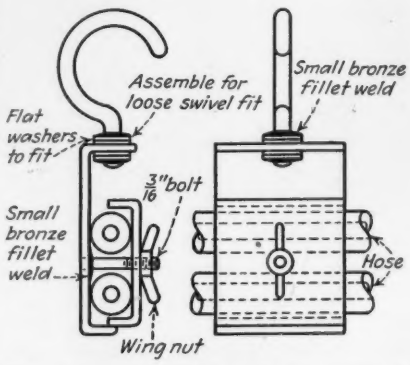
451-135

test is evident, for if these leaks had remained undetected until after the plastering was completed, later repairs would have entailed considerable expense and difficulty.

Hose Support Aids Cutting and Welding

CONSTRUCTION

Welding or cutting in elevated positions is often made difficult due to the weight of the hose which must be supported by the worker and which results in decreased mobility and increased fatigue. Personnel of the Linde Air Products Company, a unit of the Union Carbide and Carbon Company, use a simply-constructed support to eliminate these objections by holding the hose securely. In operation, the clamp is

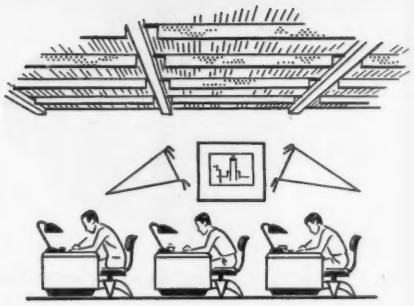


Hose is supported by easily-constructed clamp and hook which can be attached to any handy fixed object. Strain is thereby minimized for worker performing cutting or welding operations and danger of slippage is eliminated.

tightened around the hose about 5 or 6 feet from the blowpipe and the hook is attached to any convenient fixed object.

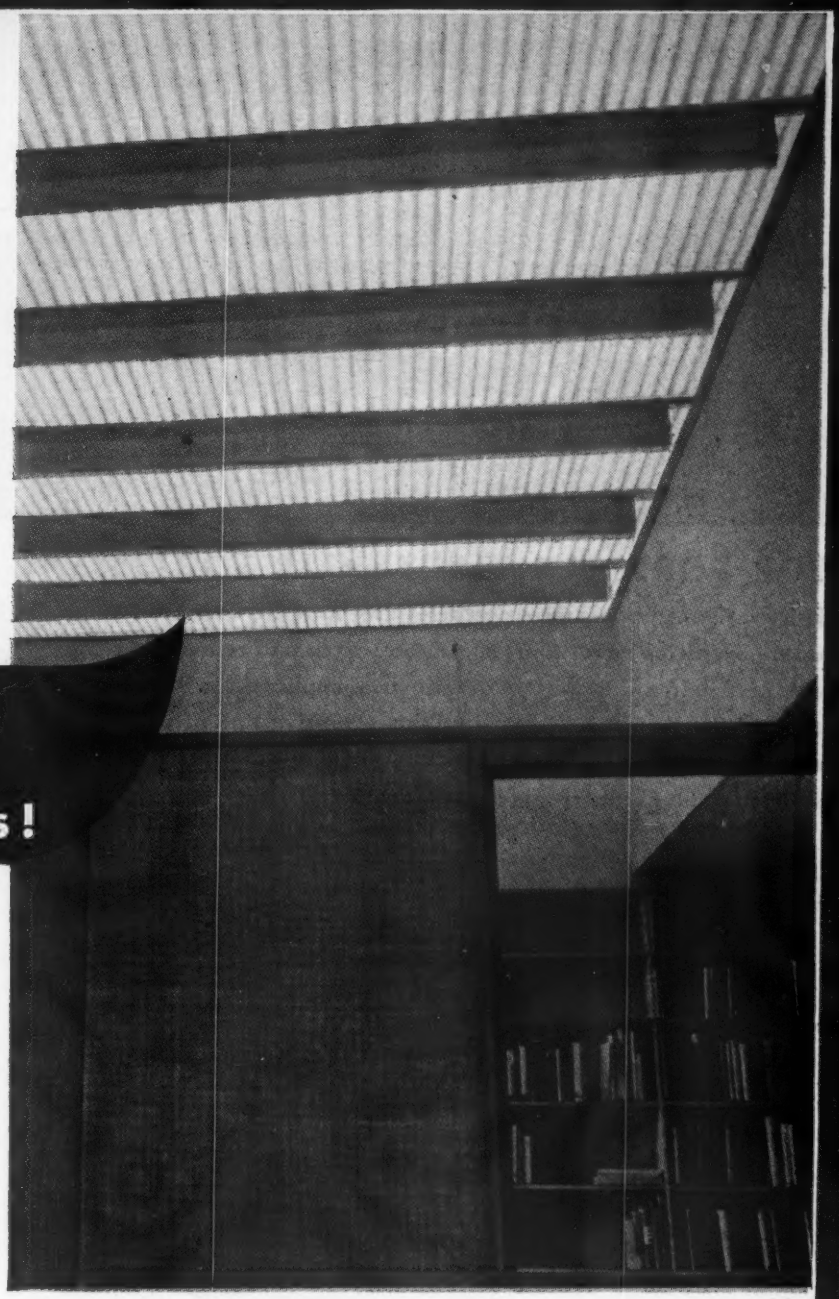
As indicated by the drawing, the hook is formed by heating and bending a ¼-inch diameter mild steel rod to shape, and the two parts of the clamp are cut and formed from ⅛ by 2-inch hot or cold-rolled steel strip. Corners and edges of all parts are ground to prevent damage to the hose. Contrary to conditions existing when S-hooks, wire loops or rope is used to hold hose, the possibility of slippage is negligible and the worker is permitted maximum freedom of movement with minimum strain.

In the event that the length of the hose line from the point of support to the point of application is to be frequently lengthened or shortened, the holding clamp can be loosened and refastened by a twist of the locknut which controls the pressure exerted on the hose by the strap-formed pressure plate.



Quality Lighting at M.I.T. with

PLEXIGLAS Wall-to-Wall Lighting Fixtures!



PLEXIGLAS has brought a new development to large-area lighting —complete wall-to-wall *illumination without glare or shadows.*

In a typical installation at Massachusetts Institute of Technology, panels of corrugated white translucent PLEXIGLAS suspended below fluorescent lighting, provide glare-free, shadow-free lighting throughout the Provost's office. The acrylic plastic sheets rest on angle irons from which extend acoustical fins.

Actually, large PLEXIGLAS panels, installed wall-to-wall, diffuse light so perfectly that shadows and glare simply vanish. Brightness ratios are amazingly low. Eye-strain is eliminated. And at the same time overhead safety is increased and maintenance costs go down because PLEXIGLAS is light, strong, shatter-resistant.

Quality lighting is essential for schools, offices, public buildings—wherever optimum illumination is desired with no direct or reflected glare. We'll be glad to send you full information on how to solve your lighting problem with PLEXIGLAS lighting fixtures. Just write on your letterhead.

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DURABLE • DEPENDABLE

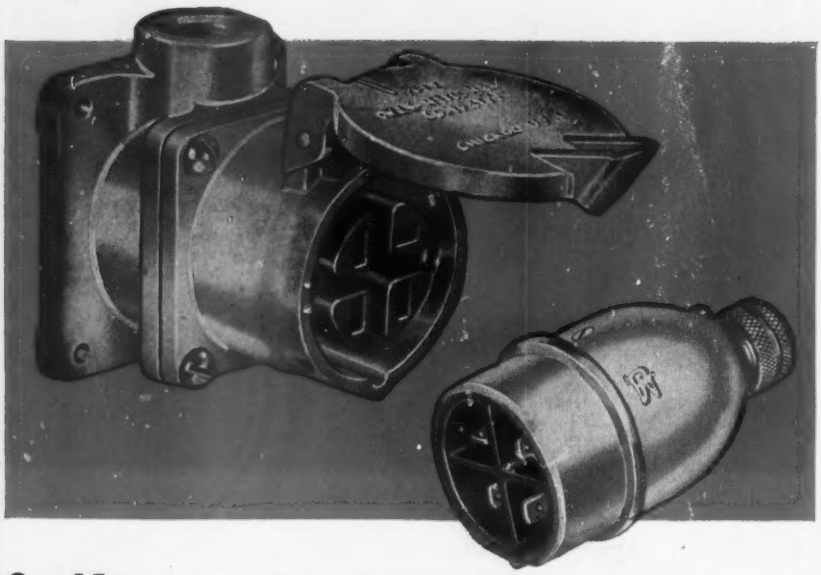
PYLE-NATIONAL

Heavy Duty Plugs and Receptacles

1, 2, 3, 4, 6, 8 pole interchangeable contact units

FOR PORTABLE ELECTRICAL EQUIPMENT

Pyle-National plugs and receptacles are built to withstand the most severe operating conditions, as proven by years of remarkably dependable service in a wide variety of industrial applications. The many substantial construction features of this extensive line of plugs and receptacles and the high quality of materials and workmanship insure safe operation, uninterrupted service and long life.



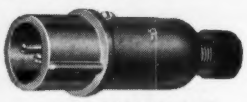
QuelArc • *Circuit Breaking Series* **Unique partitioned insulation provides long insulated paths through air and across surfaces for exceptional protection in these current rupturing devices. Galvanized cast metal housings, bakelite insulation and individually renewable contacts insure long service life. Ratings 20, 30, 60, 100 and 200 amperes, 250 volts DC, 600 volts AC—2, 3, and 4 pole—grounded through shell or extra pole. Threaded cap, plain and hinged spring door housing styles are available.**

Triploc *and Multiple-Circuit Series*

A line of exceptional versatility, unequalled in the heavy duty field, with a virtually unlimited number of assembly combinations for varied applications. Offers a selection of 1, 2, 3, 4, 6 and 8 pole contact units which are interchangeable and reversible in any single set of housings. Many types of single housings available of pressed steel with automatic lock and of cast metal threaded for watertight gasket seal. Multi-Circuit housings—2, 3 and 4 gang—available for combinations up to 32 poles. Ratings 15 and 20 amperes, 250 volts DC, 460 volts AC—circuit breaking. Pressed steel fusible and fuseless plugs measure 1 13/16″ outside diameter.

Midget Triploc *Series* **Same construction features as Triploc except for much smaller outside diameter of plug shell—only 1¼″. Interchangeable and reversible contact units—2, 3 and 4 pole—are of the flat blade type. Rated 10 amperes, 250 volts; 15 amperes, 125 volts.**

2-Gang Receptacle



Fusible Plug

Fuseless Plug

General Purpose *Series* **Available with cast metal housings in many types for circuit breaking and disconnect service. 30 amperes, 125 volts DC, 250 volt AC—1, 2, 3, 4, 5 and 6 pole. 60 amperes, 250 and 600 volts—3, 4 and 5 pole. 100 ampere, 250 and 600 volts—2, 3 and 4 pole. Also many special types, fusible and fuseless, for varied applications.**

THE PYLE-NATIONAL COMPANY

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Industrial Electrification

Automatic Time Switches For Industry—Part II

The importance of careful switching mechanism design to time switch operation; also a helpful guide to selection of the proper time switch for specific applications and circuit conditions.

By George E. Sangster
Sales Research Engineer
Sangamo Electric Company
Springfield, Illinois

SWITCHING mechanisms of time switches include the operating levers, which link the dial with the switch blades, as well as the switch contacts. Free-moving operating levers are necessary to minimize friction and provide for easy and positive switching action. This is accomplished in a good switch by careful mechanical design and plating of parts to prevent corrosion and rust. Operating levers may be tripped manually, for either ON or OFF operations, without affecting the time or sequence of automatic switching performed by the tripping levers on the dial.

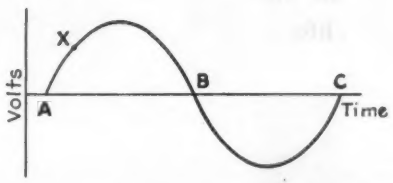


FIG. 9—Alternating current-voltage cycle for time switch operation.

Switch contacts, one of the major factors in service life, have two classifications: momentary and load.

Momentary contacts are of a relatively low power rating, and are available on some switches for ringing a bell or actuating some form of alarm. These may be auxiliary to the main contacts which control the load. Typically, these contacts close for intervals measured in seconds.

Load contacts are in the circuit which is under time switch control. These contacts may be rated either in watts or in amperes at the operating voltage. This rating is based on the

STANDARD WIRING DIAGRAMS

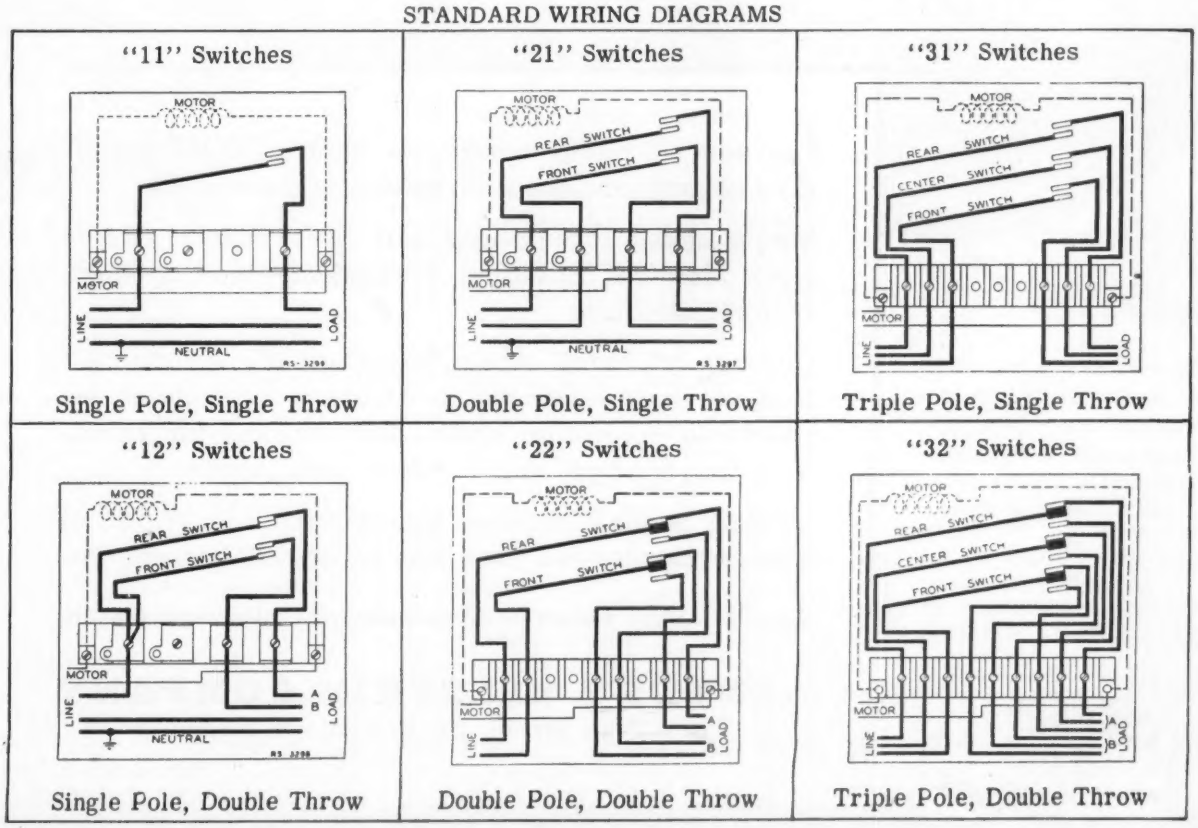
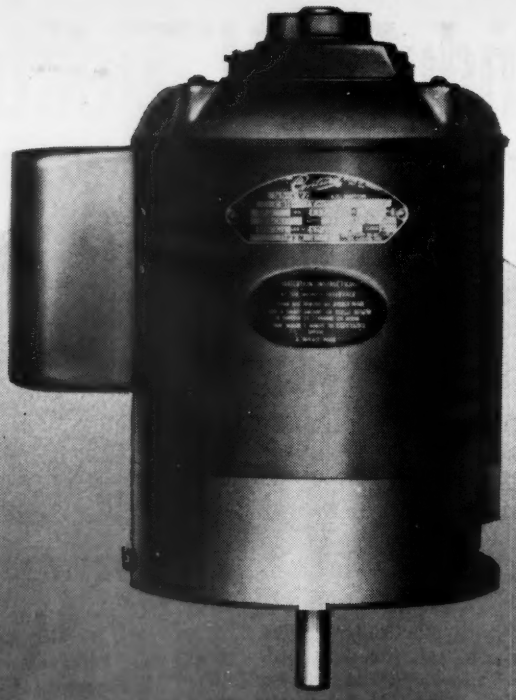


FIG. 10—Typical wiring diagrams for time switches with various combinations of poles and "throw".

Century ½ horsepower jet pump motor with keyed shaft; available with threaded shaft.



Century's

Line of JET PUMP MOTORS

Have starting, running and speed characteristics needed for the most efficient operation of the pump

The new jet pump motors are built to NEMA standards of performance and mounting dimensions.

Single phase, three phase and direct current motors have identical mounting dimensions—making them interchangeable.

Century Jet Pump motors are ruggedly constructed and carefully balanced to assure a long life of dependable operation, under the unlooked-for conditions surrounding many pump installations.

Century builds a complete line of motors in a variety of kinds and types—in sizes from 1/6 to 400 horsepower.

Popular types of standard ratings are generally available from factory and branch office stocks.

Specify Century motors for all your electric power requirements.

CENTURY ELECTRIC COMPANY
1806 Pine Street, Saint Louis 3, Missouri

Century C MOTORS

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Officer and Stock Points in Principal Cities

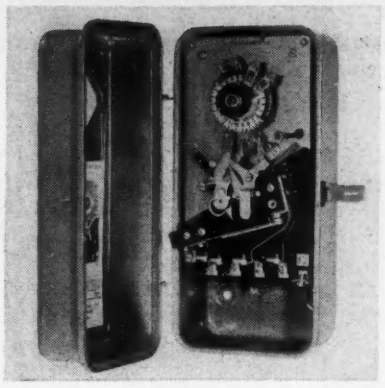

FIG. 11—Enclosure for indoor mounting of time switch. Unit has conduit knockouts, gasketed cover and sealable hasp.

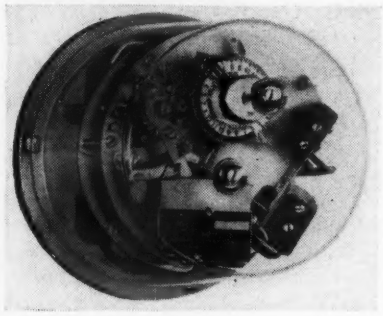

FIG. 12—Plug-in type of time switch with glass cover for outdoor mounting fits standard meter socket, has locking ring, and sealable openings for time setting and manual switch operation.

FIG. 13—Automatic time switch controls circuits for protective flood and yard lighting in this industrial plant.

power that the switch can carry continuously without overheating, and the blades and contacts are designed accordingly. Close alignment of blades and proper pressure between contacts is necessary to avoid overheating and provide maximum contact life. As in any electrical device, the insulation of the switch terminal block and spacing of other parts are designed to withstand the voltage of the circuit which the switch controls.

Load contacts and switching mechanism may be one of three basic designs. One design permits a slow break and a narrow gap with a minimum arc. This design is suited only to alternating current circuits and on such circuits is superior to other designs because of the following "minimum arc" principle.

For example, with a narrow gap, if the circuit is broken under load at X (Fig. 9), the power dissipated in any arc that is drawn will be low in value and proportional to the product of the gap voltage drop, V_D, and the load current I_L. This gap voltage drop is a fraction of the circuit operating voltage, and is the product of I_L and the gap resistance, R_G. R_G increases with the gap width. With resistance loading in the circuit, an arc formed under the gap voltage drop at X dies by the time the voltage reaches zero at B. When properly designed for the minimum arc principle, the gap is sufficiently wide to provide circuit resistance which the full voltage drop in the one-half cycle from B to C cannot break down to form a new arc. Thus, with this design an arc drawn on breaking the circuit cannot exist for more than one-half cycle.

The minimum arc gap makes feasible a slow-breaking switch that has a simplified operating mechanism as compared with that of a quick-break switch. The small, low-power arc of short duration also minimizes the pitting of contacts. This principle of switch design is known to be used by only three time switch manufacturers, and is adaptable only in switches for alternating current circuits.

Another basic switch design employs a quick-break snap action with a comparatively wide gap to minimize and break the arc on interrupting the load circuit. In snap-action, quick-break switches the gap may be three to four times as great as a gap of about 0.025 inches used in the minimum arc gap design. The snap-action switch was designed originally to minimize arcs formed on breaking direct or constant current circuits, and was adopted for time switches for alternating current circuits before the minimum arc principle was introduced in the United States for the first time about 1932. The quick-break switch requires a spring and special construction to obtain the necessary snap action of the blades and thus tends to have a shorter mechanical life than a slow-breaking switch. The wide gap tends to draw a long arc with relatively high power dissipation and, unless suitable materials are used in the contacts, contact life will be comparatively short.

Switch contact materials may be copper, solid silver, silver faced, or silver alloy. With the low-power arc obtained in time switches using the minimum arc principle of design for alternating current circuits, solid silver or silver faced is ideal for contact buttons, because of the high thermal and electrical conductivity of silver and its resistance to corrosion and the formation of nonconducting surface film. Where arc are not controlled and may have relatively high power dissipation, silver faced contact buttons are inferior to solid silver buttons because of the smaller volume of material and probable shorter life, but a good noncorrosive contact surface is provided by this method.

Silver alloy contacts should give the best performance on snap-action switches, because the alloys are harder and have a higher melting point than silver. With these characteristics, silver alloy contacts in snap-action switches show the greatest resistance to melting under the arc drawn on opening the circuit, and to deformation by the hammer-like blow that accompanies closing the circuit. This minimizing of the deformation of contact buttons, helps maintain proper switch gap and pressure adjustment, and thus helps increase contact life.

Also, switch closure with snap-action switches may cause contact deterioration unless special care is used in design and construction to prevent contacts in such switches from closing with a bouncing motion. If the resulting arc melts the surface material, some welding of contacts may occur. Repeated action causes pitting and faulty contacts. This effect will vary with types of loads of the same steady-state current rating. For example, welding of contacts is more liable to occur on heater loads than on inductive loads, such as motors or solenoids. On

closing the contacts in a heater load circuit, full load current flows in the arc beginning with the first bounce. But on inductive loads, because of the inherent time lag, full load current does not develop until after the period of bounce has probably passed.

Satisfactory performance under the above conditions of operation on simulated service life tests are all-important factors in Underwriters' Laboratories approval of time switch ratings.

Mercury tube contacts—a third basic design for load contacts—are used in time switches made and rated specifically for use on direct current load circuits. On these circuits, mercury tube contacts are superior to snap-action switches with button contacts. On direct current circuits, contact life is shorter and rating is lower than the alternating current rating for a given snap-action switch because of the characteristic persistence of the continuous current arc. On breaking the d-c circuit, power dissipated in the arc tends to melt and transfer material from one contact to the mating contact. This action forms a peak on one contact and a crater on the other, and may result in a varying degree of sticking, or welding, depending on the type and voltage of the load on the circuit. These troubles are avoided with mercury tube contacts. In some electrically-wound switches made for alternating current circuits mercury contacts are also used.

Switch Enclosures

Time switch cases are often the last consideration, but are not the least important in time switch construction to provide long periods of trouble-free service. Service conditions should govern the requirements of case construction selected for a given application.

Painted sheet metal, ungasketed cases will provide adequate protection for satisfactory operating life of the operating mechanism and contacts, under dry, clean, non-corrosive conditions. But where damp, dirty or corrosive atmospheres prevail, cases with a more permanent finish and gasketed covers are necessary to provide long, economical operating life. Some switches have an internal dust cover over the timing mechanism for extra protection and prolonged operating life.

Special cases of cast iron, parkerized, painted and gasketed for outdoor installations save the cost of extra, protective housings.

Guide to Selection

Selecting the right time switch for a given job is fairly simple providing one keeps in mind the three main parts of time switches (drive, dial and switching mechanism) and the conditions that govern the use of the variations under each of these three main parts. The following will serve as a general guide in selecting a proper time switch:

1. DRIVE:

a. *What is the nature of the power supply? If power supply has controlled, constant frequency without power interruptions, choose a straight synchronous drive. If power supply has constant frequency, but power interruptions are prevalent and switch location is isolated, choose a synchronous carryover drive. With varying frequency and/or power interruptions, or with direct current power supply, choose an electrically-wound drive.*

b. *What voltage and frequency are available* for use on time switch *motor?* Time switch motors are usually supplied for 120 or 240-volt, 60 cycle operation, although 24 volt, 25 or 50-

TYPE COMPARISON OF COMMON TIME SWITCHES

	SWITCH	Aitken-Reed	Anderson	Austin	Automatic	Gen. Electric	interMatic	Lumenite	Paragon	Reliance	Sangamo	Tork
BASIC SWITCHES	SPST-120 Volts	S-1130	TBD-11618 11302-5	S-1130	110;120; 130;145	(T-27) 83 x 948 (T-47) 414 x 94	TS-41	E-111; LW-111	301; G-25115	W-11;RM; M-1	L-11;W-11; S & SR	191;1191 948
	SPST-240 Volts	S-1115	TBD-11621 11303-6	S-1115	110;120 130;145	(T-27) 83 x 949 (T-47) 414 x 95	...	E-211; LW-211	302; G-25230	W-11;RM; M-1	L-11;W-11 S & SR	191;1191 ...
	DPST-120 Volts	S-2130	TBF-11602	S-2130	230;245	(T-27) 83 x 952	...	E-121;LW-121	303;G-40115	W-22;M-2;RM-5	L-21;W-21	962;1962
	DPST-240 Volts	S-2115	TBF-11605	S-2115	230;245	(T-27) 83 x 953	...	E-221;LW-221	304;G-40230	W-22;M-2;RM-5	L-21;W-21	962;1962
	TPST-120 Volts	...	...	...	...	...	...	...	...	...	L-31;W-31	963;1963
	TPST-240 Volts	...	...	...	...	...	...	...	...	...	L-31;W-31	963;1963
	SPDT-120 Volts	...	11610;11308	...	...	(T-27) 83 x 950	...	E-112	305	W-12	L-12;W-12	197;967;197N
	SPDT-240 Volts	...	11613;11309	...	...	(T-27) 83 x 951	...	E-212	306	W-12	L-12;W-12	197;967;197N
	DPDT-120 Volts	...	...	...	...	(T-27) 88 x 443	...	...	...	...	L-22;W-22	...
	DPDT-240 Volts	...	...	...	...	(T-27) 88 x 444	...	...	...	...	L-22;W-22	...
	TPDT-120 Volts	...	...	...	...	...	...	...	...	...	L-32;W-32	...
	TPDT-240 Volts	...	...	...	...	...	...	...	...	...	L-32;W-32	...
OPERATING FEATURES	Carryover	...	MS Types	...	...	...	...	...	...	...	W;TC	L (Handwound)
	Elec. Wound	...	MS Types	...	...	...	...	...	...	...	TC	...
	Astronomic Dial	...	TB & MS	...	...	Possible on T-27	...	...	...	W-11A;W-22A	LZ;WZ;TCZ	All except 948
	Two Circuit	...	...	...	2130;2145; 2230;2245	(T-27) 88 x 449;88 x 450;88 x 455;88 x 456	...	LL1 thru LL9	G1 thru G8; G27	W-33	LY WY	196;3191/91; 199;3962/91; 3962/82
	Duplex	...	...	...	...	...	...	...	...	...	LD	...
	Omitting Device	...	MS Types	...	145;245	Possible on T-27	...	LW Series	...	Possible on M Types	LH;LF;WH;WF	All except 948
	Advance Time Dev.	...	...	...	...	...	...	...	...	...	LHE;WHE	...
	Plug-In	...	...	...	110	...	...	...	...	...	SJ	918
	Poultry-Dimmer	P-1230	...	P-1215	162P	...	...	P-11	PS-30 Series PIP	...	...	Series 5190
	Direct Current	...	MS Types	...	...	...	...	...	...	...	TC	...
	Program Dial	...	...	...	...	...	...	DA Series	100 Series	...	TC	...
	7-Day Dial	...	...	...	...	...	...	W Series	700 Series	...	...	...
	Minimum ON Periods	90 min.	(Unknown)	90 min.	15 min.	T-27: 3 min. T-47: 5 min. ...	15 min.	E: 120 min. LW: 60 min. ...	300: 120 min. G: 90 min. ...	W: 30 min. M: 30 min. ...	L & W: 30 or 90 min. S & SR: 30 min. TC: 15 min.	All 45 min. except 948: 90 min.
	Minimum OFF Periods	90 min.	(Unknown)	90 min.	45 min.	T-27: 90 min. T-47: 120 min. ...	180 min.	E: 120 min. LW: 60 min. ...	300: 120 min. G: 45 min. ...	W: 60 min. M: 480 min. ...	L & W: 90 or 30 min. S & SR: 30 min. TC: 15 min.	All 45 min. except 948: 90 min.
	Motor Mfr. Motor Speed RPM	Hansen 600	(Unknown) (Unknown)	Hansen 600	Haydon 450	Telechron 3600	Haydon 450	Telechron 3600	Telechron 3600	Hansen 600	Sangamo 450	4 Types 3600-1200-450

Time switch selection chart, offered as a general guide, showing the more common types of switches available for most industrial, commercial and domestic applications. Check manufacturer's catalogs for available pole, throw and switching arrangements as well as operating features.

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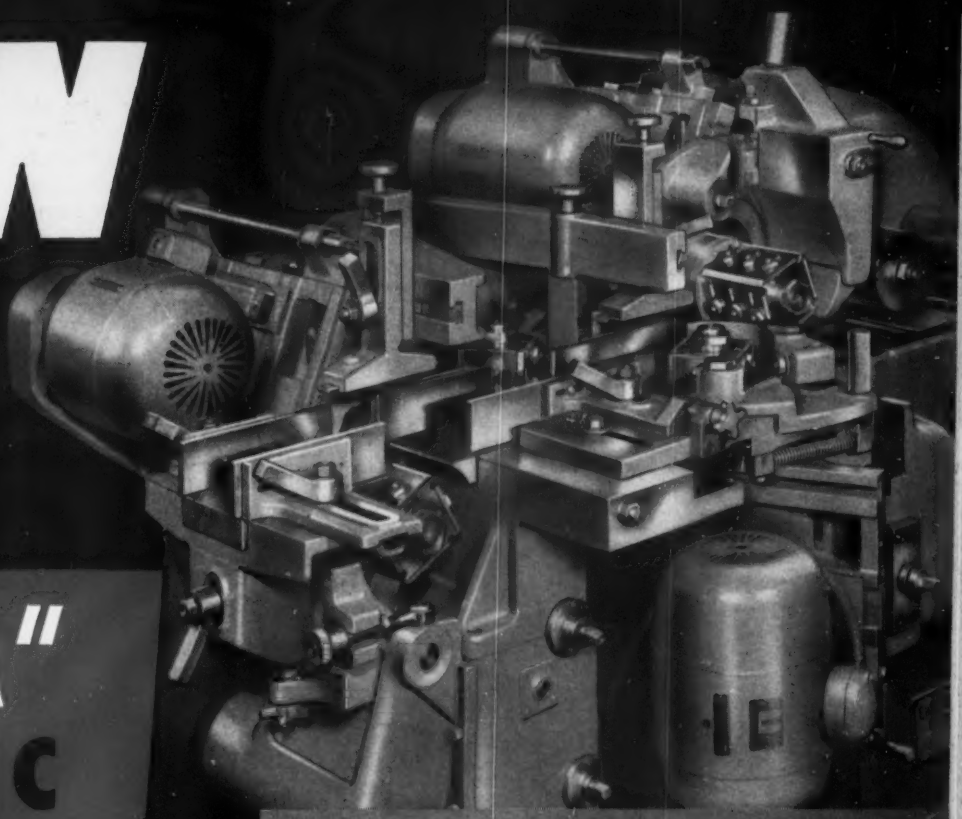
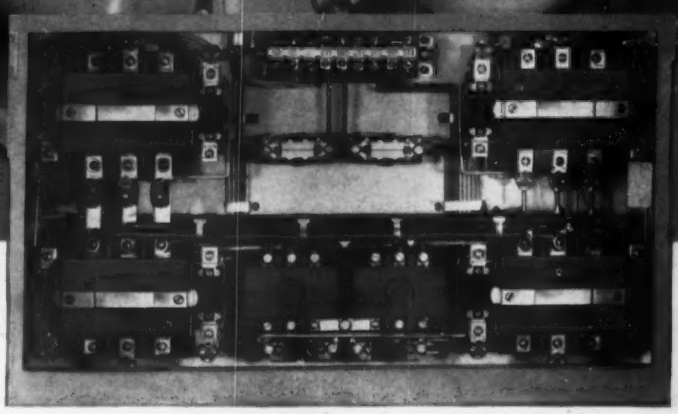


TYPE "RA" MAGNETIC STARTERS

SIZE 2

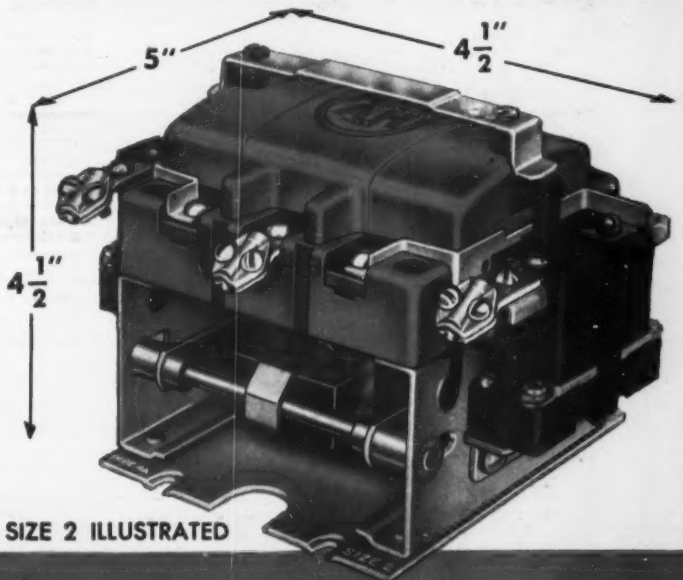


Versatile IN APPLICATION IN PERFORMANCE

The Ekstrom Carlson moulder features a special control panel designed and built by W. F. and John Barnes. This panel, only *14" x 22"*, contains four Arrow-Hart Size 2 magnetic starters and one Size 1 magnetic reversing starter, with a unique center line wiring plan. These design innovations were made possible by the use of Arrow-Hart's new "RA" line of motor starters that are only 1/2 the size of conventional starters. This compact panel has a capacity of over *100 H.P.* of divided motor controls with room to spare.

NEW RIGHT ANGLE BALANCED MECHANISM SAVES SPACE, PERMITS UNUSUAL LAYOUTS

Arrow-Hart's new right angle balanced mechanism has a knee-action bellcrank fulcrum, which transfers the leverage from a vertical to a horizontal plane. This multiplies the leverage and increases contact pressure. Greater power, finer balance, versatility — in an ingeniously compact design that cuts conventional starter size in half — all of this is due to the amazing new right angle, fail safe, balanced mechanism developed by Arrow-Hart.



SIZE 2 ILLUSTRATED

CONTROLS and APPARATUS FOR *Outstanding* PERFORMANCE

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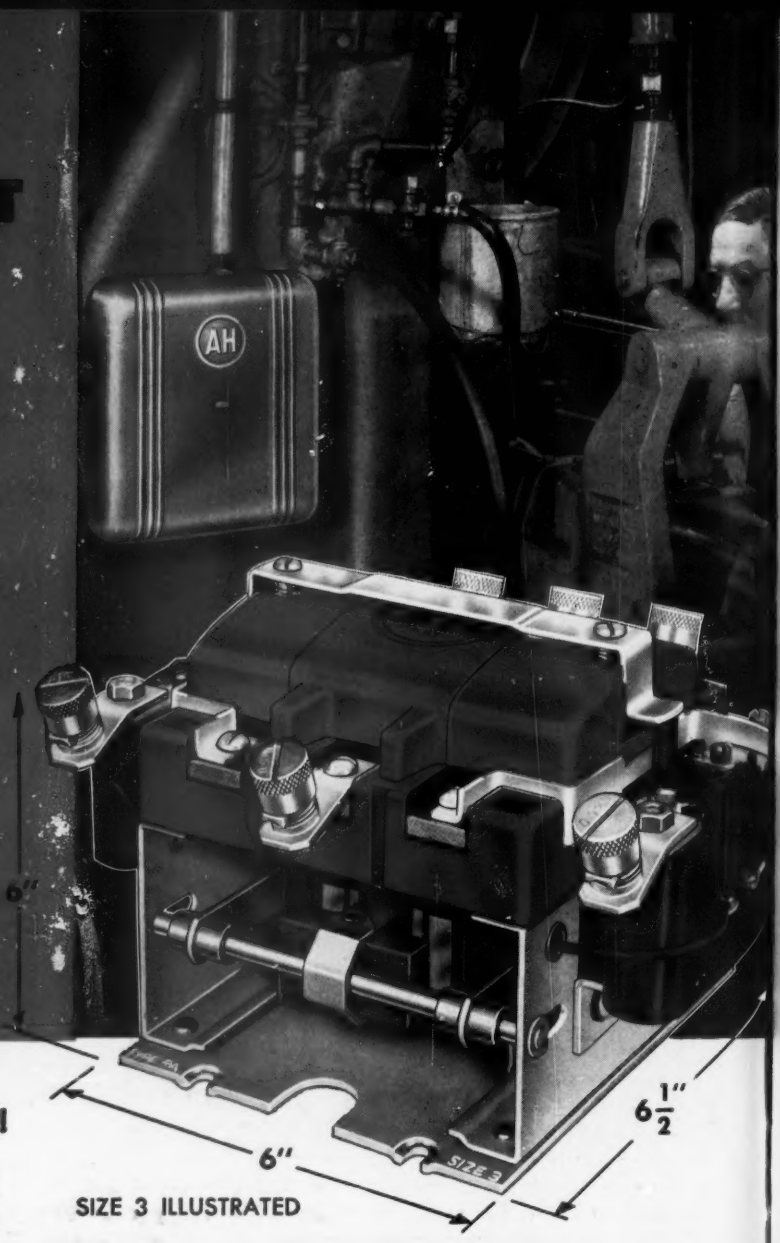

SIZE 3 ILLUSTRATED

COMPACT—½ the size of conventional starters!

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Straight through wiring reduces bending and forming of heavy wires. Terminals are front wired. Line and load wires connect at opposite ends. **SAFE AND DEPENDABLE** High power at low wattage. Tough, dependable overload relay, with bimetallic inverse time element. Interchangeable heaters. **NEW, TOUGHER CONTACTS** A broad line-of-contact surface. Curved and movable against flat and stationary contacts. Tips of special silver alloy brazed to copper. **PLASKON ALKYD BASE AND HOOD** New tested Plaskon Alkyd molding compound used in protective base and hood. Exceeds arc resistance of next best material by 50% to 60%.

SIZE 2 MAX. H.P.

Volts	110	220	440	550
Single Phase	3	7½	10	10
Polyphase	7½	15	25	25

SIZE 3 MAX. H.P.

Volts	110	220	440	550
Single Phase	7½	15	25	25
Polyphase	15	30	50	50

WRITE TODAY FOR LITERATURE ON ARROW-HART TYPE "RA" MAGNETIC STARTERS AVAILABLE IN LOCAL AND REMOTE CONTROL OR SELECTOR SWITCH TYPES IN SIZES 0, 1, 2 and 3

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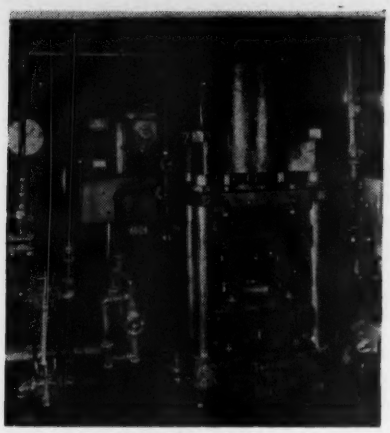

FIG. 14—Plastic molding press heaters are brought up to operating temperature before working hours by automatic time switch control on panel in background.

cycle motors are available. Therefore, *choose a motor rated for voltage and frequency of the power supply.*

2. DIAL:

a. *How many operations per day are required?* On some makes of time switches it is possible to get as many as six or seven complete operations (ON and OFF constitutes a complete operation). On other makes it is possible to have only one. *Check the manufacturer's literature and be sure the switch under consideration meets the job requirements.*

b. *What is the minimum time of required ON and OFF periods?* Because construction differs with various makes, these minimum time limits vary from two hours to five minutes. Literature of manufacturer will specify these minimum limits.

If required minimum ON or OFF periods are shorter than manufacturer's minimum time limits, the job can likely be done by a program dial which is graduated as close as every five minutes. As this dial is much larger than the ordinary 24-hour dial, the time switch is correspondingly bulkier, and installation space greater.

c. *If operations are to be at entirely different times on each succeeding day, select a 7-day calendar dial.*

d. *Is switch operation to vary with sun time? If so, choose an astronomic dial.* Operation (usually OFF) two hours either side of midnight can be set by a midnight bridge provided with each astronomic dial. *In specifying, keep in mind that most types of astronomic dials cannot be used with omitting or advance time operation devices. Also, latitude or place of installation is necessary information in ordering astronomic dials.*

3. SWITCHING MECHANISM:

a. *What load is to be controlled?* There are three things to consider in answer to this question: the number of *poles,* the *throw,* and the *capacity*

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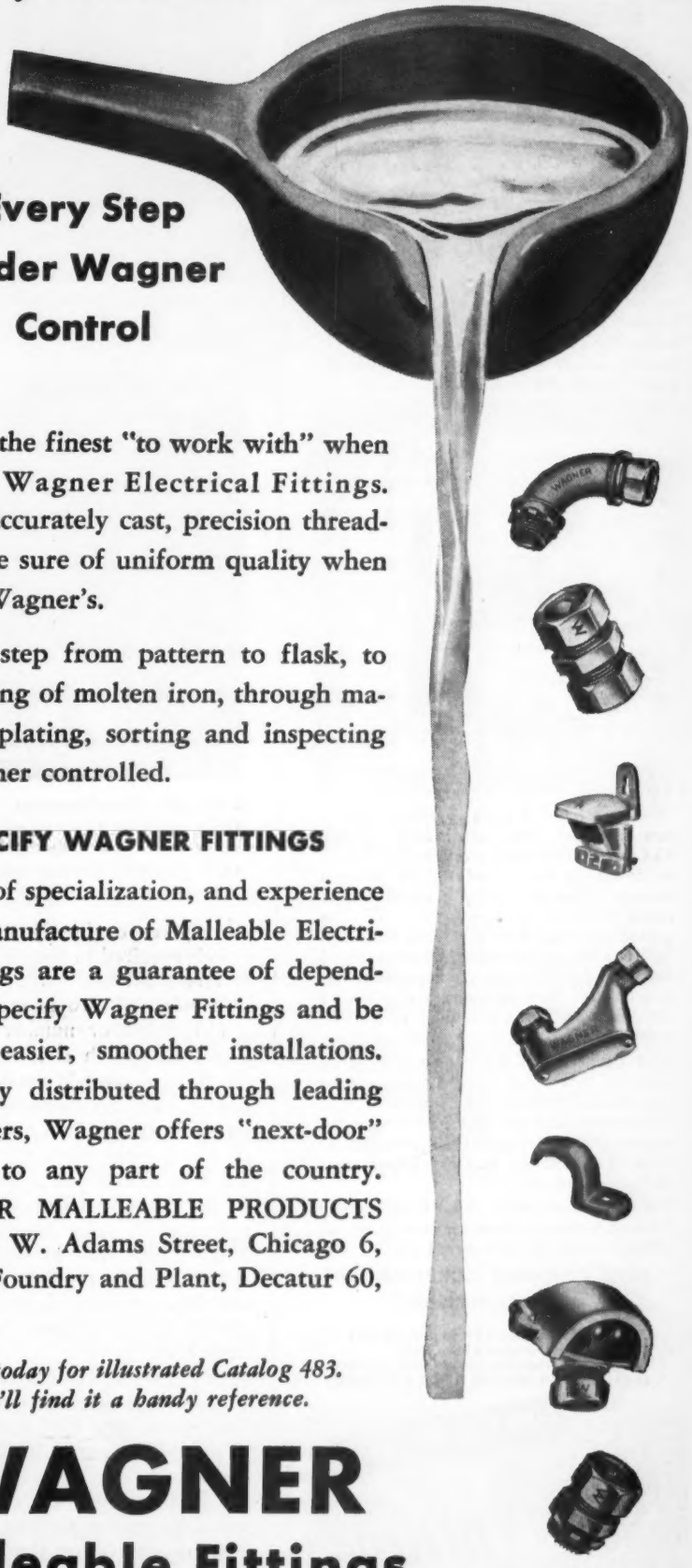

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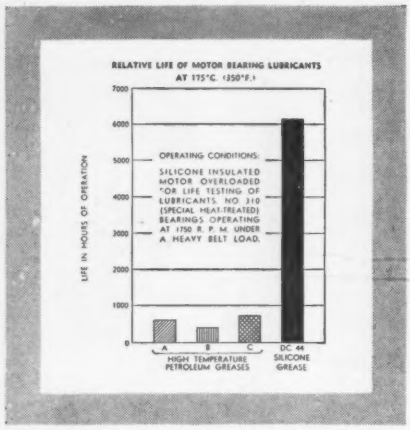

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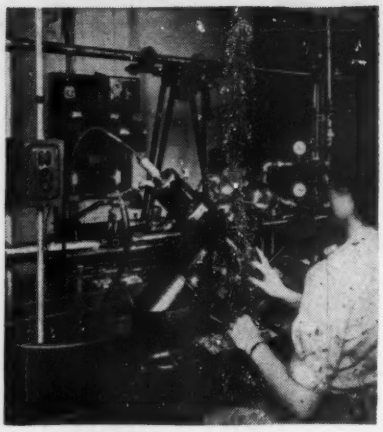

FIG. 15—Motor on Automatic Wheel Fitter is cut in by time switch before working hours to permit parts to heat and expand to normal operating conditions before production starts.

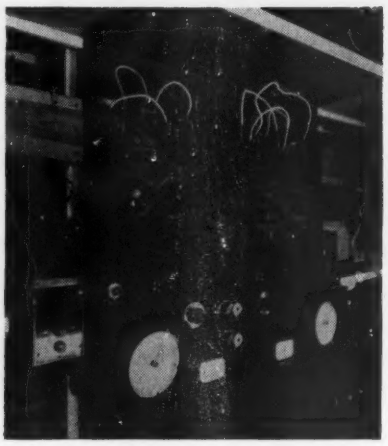

FIG. 16—Synchronous carry-over time switches control meter test circuits; provide three ON and three OFF periods during overnight test between work shifts.

in amperes or in watts, of the time switch required to control load. Manufacturers' literature will indicate available switching provisions and ratings.

(1) *Poles,* or number of contacts. The time switch is to stop and start the flow of electric current to a particular load. *By "rule of thumb" one less pole is required than the number of wires supplying current.* Thus, for a 2-wire circuit, use a single-pole time switch; for a 3-wire circuit, use double-pole switch; for a 4-wire circuit, use a triple-pole time switch. *Exception: Where existing regulations specify that both sides of circuit be broken, a 2-wire circuit would require a double-pole switch, etc.*

(2) *Throw.* To stop the flow of current select a single-throw time switch. To *"throw"* the load from one circuit to another, select a double-throw time switch.

(3) *Capacity.* Time switches are *rated in amperes-per-pole or watts-per-pole,* depending on the manufacturer. This capacity is generally based on the size and quality of the contact buttons themselves as explained previously. Usually it is a simple matter to figure the amperes or watts the load is going to draw, to determine whether to connect the time switch directly in the circuit, or whether to use the time switch to control a relay, which, in turn, will control the load circuit where the load rating is greater than the capacity of the switch.

b. *If operation is to be omitted on one day from the regular sequence, select a switch with an omitting device or with a 7-day calendar dial suited for the job.* Omitting devices to prevent either the ON or the OFF operation on any day or days of the week are available. The OFF operation cannot be omitted one day and the ON operation another.

c. *Is circuit operation desired in advance of the regular sequence on Saturday or other week day?* Advance Time Devices are available with certain switches only, to turn circuit ON or OFF as desired, in advance of regular daily sequence normally set by dial levers, on any day or days of the week. However, the actual time of the advance operation must be the same for each day advance operation is desired. An advance OFF operation one day and an advance ON another cannot be obtained.

d. *Do you want to control a 24-volt (or other) circuit and yet operate the time switch motor from a 120 or 240-volt circuit?* Be sure manufacturer's literature shows that *separate motor and switch terminals are available to make this connection* which is a typical requirement in thermosat circuit applications.

Welded metal shelves, brackets and partitions convert this standard panel delivery into a well arranged service truck. Developed by Reid Electric Company, Highland Park, Michigan, for use in its electric range wiring activities, this design provides maximum storage space; keeps materials and tools readily accessible at all times; spells on-the-job efficiency.

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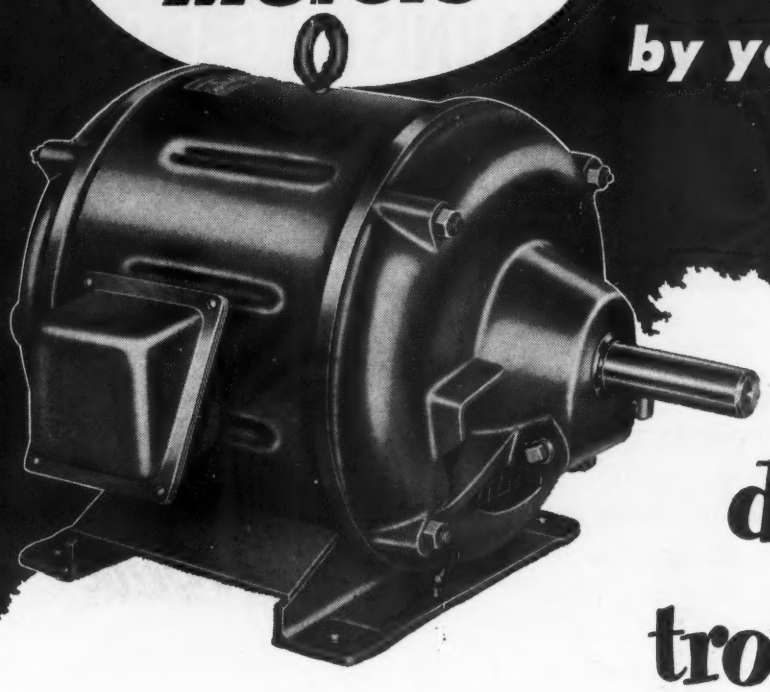

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These motors are available with either sleeve or ball bearings. They are completely drip-proof when mounted in the normal horizontal position, and by rotating the endplates are still drip-proof in the sidewall or ceiling horizontal positions.

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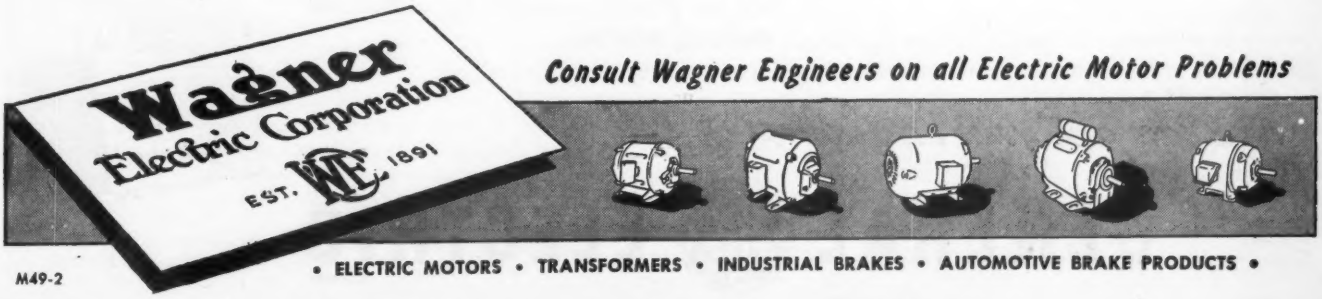

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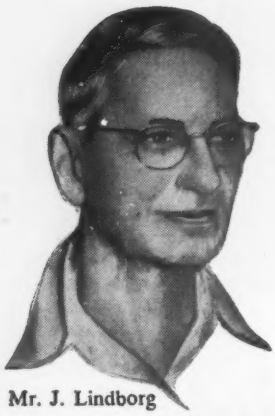

Mr. J. Lindborg

From all parts of the country, enthusiastic reports are pouring in from users of G. E's new general-purpose varnish G-E 9574.

Here's a typical statement from J. Lindborg, owner and operator of AAA Electric Motor Service, Atlanta, Ga.

"Our experience has been that this varnish is as good as G. E. claims. It gives a good coat on every type of wire, bakes easily and dries to a tough coating that stands up perfectly in service. Also, this varnish works excellently with all types of coated wire and does not damage the insulation. We like the thinner, petroleum spirits, since it is cheap and can be purchased locally.

"During the two years we have been using this varnish we have had no complaints from any of our customers concerning our work."

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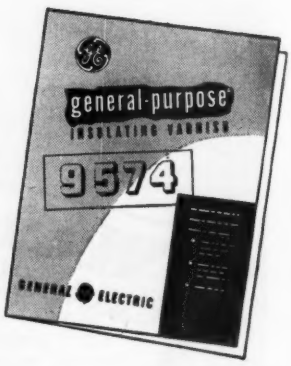
..."bakes easily"*

..."on every type of wire"

..."stands up perfectly in service"

*G-E 9574 gives excellent results on all types of coils except extra-high-speed armatures. It is one of G. E.'s complete line of electrical insulating materials.



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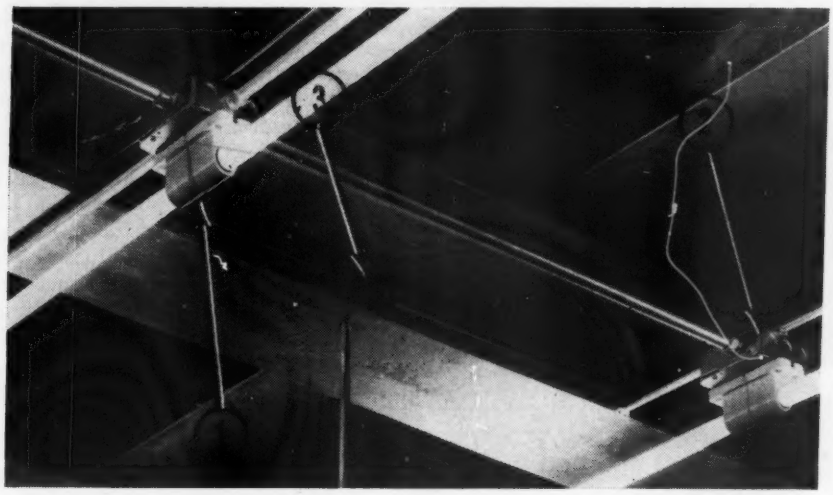
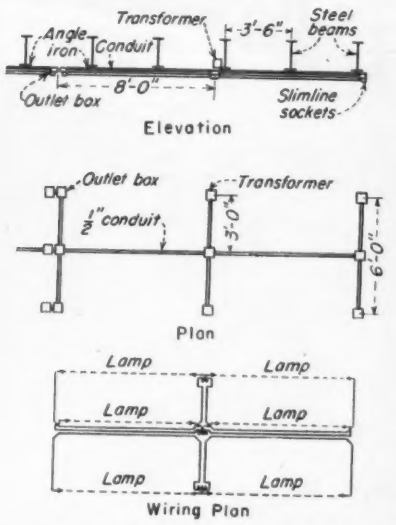
Modern Lighting

Continuous row slimline lamps provide uniform lighting on meat carcasses to permit inspection by wholesale buyers in cold storage room of Ray Weeks and Sons, Inc., Richmond, Michigan.



Lighting equipment consists of components used ingeniously. Lampholders (1) were attached to outlet box covers. Standard outlet boxes (2) were welded to bottom of beams, and transformers (3) were tack welded to beams.



Details of installation shows how 96-inch T-8 slimline lamps were spaced, installed on standard outlet boxes and wired for 300 ma. operation.

Slimlines Light Cold Storage Room

A lighting installation which represents a fresh and unique approach to one of the more difficult lighting problems has been made in Richmond, Michigan. This installation is in the cold storage and display room of Ray Weeks and Sons, Inc., where whole carcasses of meat are hung on cooling tracks for storage, and for wholesale display and sale.

The lighting objective in this installation was to provide adequate illumination of good color quality to permit accurate appraisal and quick and easy inspection of the meat carcasses by potential wholesale buyers, and to keep the amount of heat generated by the lighting equipment to a minimum.

Construction details in the cold storage area consisted of exposed I-beams located on 42-inch centers, from which cooling tracks were suspended and on which the meat carcasses are hung and displayed. The side walls are of glazed tile, light in color.

The lighting system selected to meet the lighting objective on this job consisted of six continuous rows of 96-inch T-8 4500-degree slimline lamps installed at track elevation, on the bottom of the steel I-beams. The distinctive and original feature of the installation is that the system does not involve the use of any lighting fixture channel whatsoever, in the usual sense of the word. Instead, four-inch outlet boxes were arc-welded to the bottom of the steel beams. Then slimline sockets were installed on the covers of these outlet boxes, one socket on each outlet at the ends of rows of lamps, and two sockets on intermediate outlets where two lamps join end-to-end. The 30 slimline lamps used in the installation are operated by 15 2-lamp, 300 ma. ballasts, tack-welded to the beams adjacent to a convenient pair of lamps.

Wiring was carried between outlet boxes by means of thin wall conduit. Electrical connections were so arranged that only two rows of conduit were necessary to parallel the lamps, running from one end of the room to the other. The balance of the connections, taking care of the four other rows of lamps, were carried in conduit between outlets, but running at right angles to the lamps.

The initial lighting intensity averaged 30 footcandles on the horizontal. Measured after having been in use for about one year, this intensity had decreased to an average of 15 footcandles on the horizontal 30 inches above the floor, with the room loaded with meat carcasses. The vertical illumination on the carcasses at a point seven feet from the floor averages 12 to 15 footcandles, decreasing to 7 to 9 footcandles on the vertical near the floor. Intensities were measured when the temperature in the room was 36 degrees F.

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Due to welded construction, this lighting system becomes practically as strong and as rigid as the building itself. Use of 300 ma. slimline with instant-start transformers minimizes heat conditions due to the lighting system, and difficulties which might be experienced in low temperature operation. The possibility of ballast failure is practically eliminated due to the low room temperature. With the wiring being installed in conduit, cost was also reduced to a minimum.

The fact that bare lamps are used in this installation can be justified principally because the room is used for relatively short time intervals only by any one individual, and glare, which might be expected with bare lamps, is reduced to considerable extent by the shielding afforded by the closely-spaced rows of meat.

While the footcandle intensities appear low, the appearance of the room is one of a well lighted area of uniform intensity throughout. The lighting permits accurate appraisal of the product, which is what the buyers want, and has proved to be practical and highly acceptable and satisfactory to the owner.

The design and layout of this lighting system was made by E. A. Cowgill, Floodlight Service Company, Detroit, Michigan, electrical contractors who installed the job. Cooperating in the lighting design were Detroit Edison Company lighting representatives Alfred W. Henk, Mt. Clemens, Michigan, and Donald E. Trefry, Detroit.

Low Brightness Units Light Offices

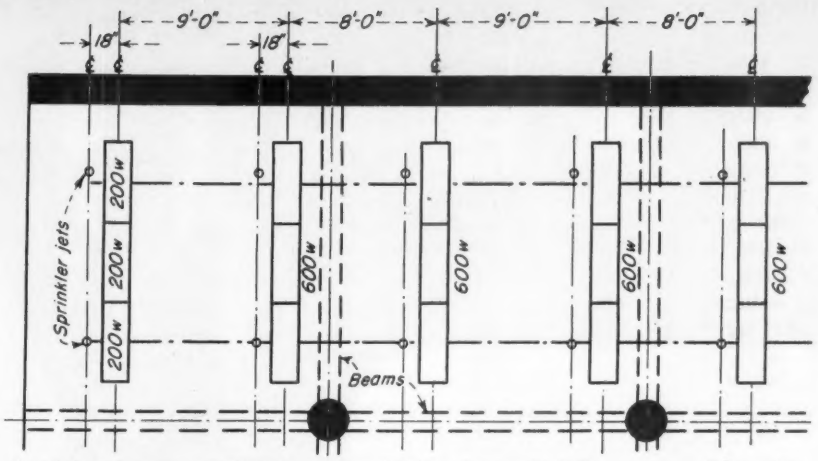
Edward Brown & Sons are general insurance agents in San Francisco. The major part of their business is general office work. This work requires a high level of illumination without shadows or glare to keep eye strain at a minimum, operating efficency at a maximum, and employee morale at a high standard.

In relighting these offices, the prime objective was to provide this type of lighting. The owners called in A. C. Andreberg and C. M. J. Wood, illuminating engineers of the Pacific Gas & Electric Co. for lighting recommendations. After careful study of the lighting problem involved, a new lighting system was designed to provide an average maintained level of approximately 50 footcandles.

The new installation, completed in November of 1948, is an outstanding example of the benefits of lighting tailored to the customer's exact needs. The average level of illumination, after 200 hours of operation, was 53 footcandles, with a maximum of 62, and a minimum of 45 footcandles.

One factor of equal importance to the high level of illumination in this installation was the low ratio of maximum to minimum brightness. This low brightness ratio was achieved through use of surfaces having a high

Over 50 footcandles of general lighting result from 4.2 watts per sq. ft. in Albright URC-type units in general offices of Edward Brown & Sons of San Francisco. Diffusing glass panels reduce brightness of units and provide soft diffused semi-indirect lighting.



Lighting layout of URC-type luminaires in typical bay area, with units located off-center to miss sprinkler outlets. Ceiling height is 11 ft. 6 in.

reflection factor throughout the office areas. The ceiling was finished off white, with 75 percent RF, the side walls were finished surf green with 49 percent RF, the floor was dark green tile with 9 percent RF, and the work surfaces on oak desks was 25 percent RF.

The general office is 187 feet by 48 feet, with an 11 foot 6 inch ceiling height, providing a floor area of 8976 sq. ft. A total of 190 URC-type luminaires, each using four 40-watt 3000° K. (Warm Tone) Sylvania fluorescent lamps were used in the installation. Six units were installed in each bay, in two rows of three units per row. In lieu of the usual type of ribbed glass used in URC-type fluorescent units, Corning Mona-Lite glass panels were used in the sides and bottoms of these units. This glass cut down the brightness of the sides and bottoms of the units very materially, and produced a unit of the semi-indirect lighting type. These units were suspended 30 inches from the ceiling, and the rows were spaced 8 feet and 9 feet apart, alternately.

All factors involved in the lighting problem in this job have been fully met. An adequate intensity of illumination for office lighting tasks was provided. It is shadowless and glarefree, and keeps eye strain at a minimum. Operating efficiency of employees is high, and the aspects of the lighting result keeps employee morale high.

The total connected power load is 38 kw., or 4.2 watts per square foot, resulting in a lighting efficiency of approximately 12 footcandles per watt per square foot. This installation was made by the Hampton Electric Company, electrical contractors of San Francisco. The lighting equipment was manufactured and supplied by Albright of California.

Christmas lighting for decoration is practised by electrical contractor J. J. "Jack" Reddington at his home in Melrose, Mass. An unusual exterior lighting arrangement was used Christmas week in 1948. Arches were formed with conduit. Fluted design tin pie plates in various sizes were used behind vari-colored lamps. PAR-38 lamps were used for highlighting figure cutouts and the front of the house. Arthur S. Allis, Boston Edison Co., cooperated in the decorative design and layout planning.

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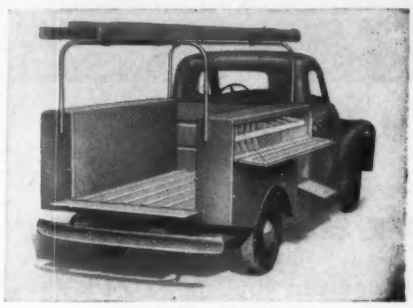
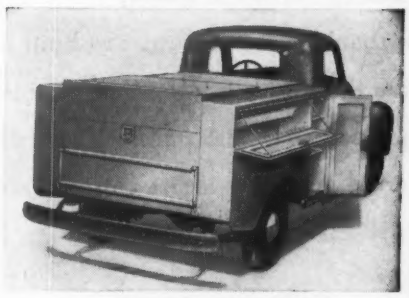


MODEL "60"



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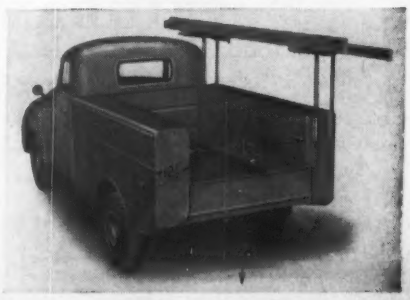

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In the News

Illinois Contractors Hold Annual Meeting

Contractors from throughout the state of Illinois convened at the Leland Hotel Springfield, Oct. 7-8, for the Second Annual Meeting of the Illinois Electrical Contractors Association (Ill. Chapter, NECA). Association progress, contractor problems, employer-employee relations, and estimating techniques were topics on the two-day agenda.

At the opening dinner session, J. T. Meek, executive secretary, Illinois Federation of Retail Associations, reviewed the basic philosophy of a trade association; warned that misunderstanding of association objectives, apathy on the part of and petty jealousies among members will cause the downfall of any organization. Lack of faith and a "let George do it" attitude are conditions that must be remedied if an association is to succeed, he added. Biggest problems confronting today's economy are the trend toward less productivity for more pay (higher costs) and the recent demands for pension plans, he concluded.

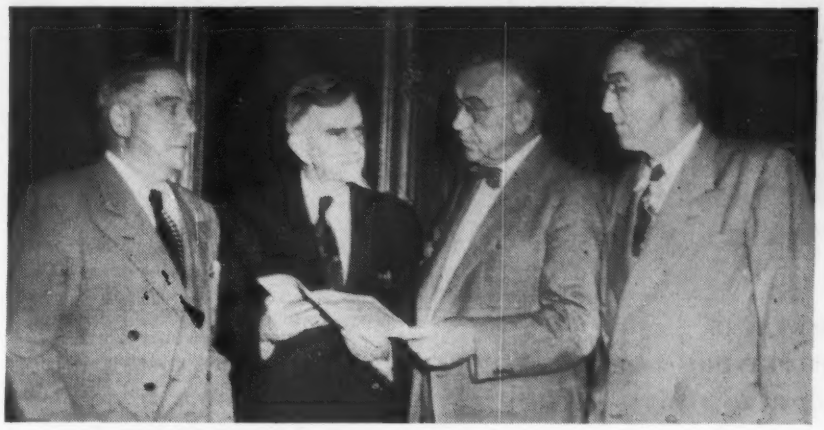
The electrical construction industry was commended for its outstanding success in the industrial relations field, by Rev. Father Shaughnessy, Chaplain, Guardian Angel Home, Peoria, and prominent in arbitration and conciliation work. Father Shaughnessy traced the development and record of the Council on Industrial Relations for the Electrical Construction Industry. The human element is by far the most important factor in industrial peace since the problem is essentially a matter of man dealing with man, he added, citing the success of the Council in disposing of some 130 cases presented during the past 30 years without a single serious strike in the industry (No work stoppage ever resulted from a Council decision). Such a record is evidence that problems can be solved amicably at the local level.

Contractors were asked two questions at the open forum session: "Do you know estimating as well as you think you do?", and "Do you evaluate your estimating procedure?" Ray Ashley, NECA Technical Director and J. Walter Collins, executive secretary, Electrical Contractors Association of City of Chicago, presented some of the answers in their ensuing discussion. Too often conduit work is overloaded with labor at the expense of other items, according to Ashley. Assign labor to the item which occasions it and not to the item on which the work is actually performed, Ashley cautioned while citing the example of outlet boxes and conduit entrances.

Collins urged the contractors to carefully evaluate their estimating procedures; cautioned against developing labor units based on performance of their best mechanics; again scored so-called "labor only" contracts and the pernicious practice of distributors selling lighting fixtures direct to consumers and then holding the contractor responsible for any damage without giving him a cushion to absorb such costs. Both speakers reiterated the need of directing more attention to estimating; development of a good estimating program; and establishment of confidence in ones own estimating and proper application of overhead. Pre-requisites of a good estimator were listed as: Vision, imagination, initiative, fortitude and diplomacy.

Following this discourse, Illinois NECA Chapter manager Jack Krider announced that plans were being completed for an Estimating Conference to be held at Bloomington, Ill., next February.

Too many electrical contractors, either through disinterest, timidity or lack of know-how are permitting specialty electrical work to be done by general and paving contractors or



EASTERN SECTION *IAEI officers in attendance at Silver Anniversary annual meeting in Boston, were (l. to r.): B. F. Greene, New York City, 1st Vice-President; B. A. McDonald, Rochester, N J., retiring President; Bernard B. Whelan, Boston, President-Elect; and Leonard J. Wylie, Hartford, Conn., 2nd Vice-President.*

FORMER CHIEFS *of Detroit's electrical inspection department recall old times with assistant chief electrical inspector Kent P. Stiner (right). They are: (L to R) Charles L. Smith, national secretary, I.A.E.I.; Carl J. Schoeninger, manager, Detroit Chapter, N.E.C.A.; and E. E. Herndon, president, Reid Electric Company, Highland Park, Michigan.*

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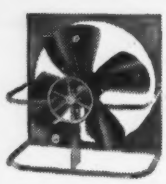

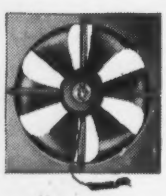

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owners themselves, intimated R. Dron, Dron Electrical Co., Granite City, Illinois. For years, Dron's firm has been doing work for utilities, street lighting, traffic signal installations, and similar projects.

W. J. Cour, assistant to NECA executive vice-president Paul Geary, reviewed the progress made with the NECA program; told those present what NECA is doing and can do for them; solicited the full cooperation of all members in attaining the association objectives.

Among the various problems discussed from the floor were: State licensing, paid vacations for mechanics; apprentice training, margins on sale of electric motors and associated control equipment. Forum chairman Lyle Foster, Peoria, revealed that since last year's convention, motor manufacturers have developed discount schedules that are more satisfactory to the electrical contractor.

State licensing of the electrical contractor is again in a formative stage. J. D. Carrigan, Representative, 18th District for the 65th and 66th Illinois General Assembly, reported that a licensing bill he introduced in the House on May 24, 1949, died in an appropriation committee. Plans are now under way to introduce a new bill in the next session and there was some indication that an electrical inspection feature might be included in the new bill.

Various reports indicated that apprenticeship training has hit a new low. Combined with a lack of laboratory equipment and contractor cooperation has been the tendency of some IBEW Locals to stop training apprentices.

To revise and to stabilize the program, the Convention, by means of resolution, asked the contractor to assume responsibility in his respective area, provide the necessary facilities and sponsor the program.

Provisions for mechanics' paid vacations are somewhat difficult due to the nature of employment in the electrical construction field, it was noted. Floor discussion, however, revealed that a plan now in operation in DuPage County provides such benefits. Contractors pay two percent of their payroll into a trust fund administered by a Joint Board.

Other interesting facts revealed at the Forum: Last year, 11,000 electrical contractors in the U. S. paid into the IBEW pension fund. NECA District 4 (Ill., Ind., Mich., Minn., Wis.,) is the second largest in the country with respect to volume of business. In the lead is District 1 (New York, New Jersey and New England States).

Glenn Durham, Springfield con-

tractor and president of the Illinois Electrical Contractors Association was chairman of the conference. J. G. Krider, Peoria, is manager of the Illinois Chapter, NECA, and Lyle Foster, Peoria contractor, a member of the NECA Board of Governors.

Lawson Named NEMA President

C. T. Lawson, vice president in charge of sales, Kelvinator Division, Nash-Kelvinator Corporation, Detroit, Michigan, was elected president of the National Electrical Manufacturers Association at the annual NEMA meeting at Atlantic City, November 16th. He succeeds B. W. Clark, vice president in charge of sales of the Westinghouse Electric Corp., Pittsburgh, Pa.

Other officers elected were: Vice-Presidents—C. W. Higbee, manager, Electrical Wire & Cable Department, U. S. Rubber Co., New York, New York; J. H. Jewell, vice president, Westinghouse Electric Corporation, Pittsburgh, Pa.; James F. Lincoln, president, The Lincoln Electric Company, Cleveland, Ohio; E. E. Potter, vice president, General Electric Co., New York, N. Y.; A. F. Sheldon, vice president and general manager, Kennecott Wire & Cable Co., Phillipsdale, R. I.; Treasurer—Everett Morss, president and treasurer, Simplex Wire & Cable Co., Cambridge, Mass.; Members at large of the Officers Committee —Charles E. Swartzbaugh, president, The Swartzbaugh Mfg. Co., Toledo, Ohio; G. C. Thomas, Jr., president and treasurer, The Thomas & Betts Company, Elizabeth, New Jersey.

C. T. LAWSON (left) of Nash-Kelvinator, succeeds B. W. Clark (right) of Westinghouse, to presidency of the National Electrical Manufacturers Association at annual meeting in Atlantic City, November 16.

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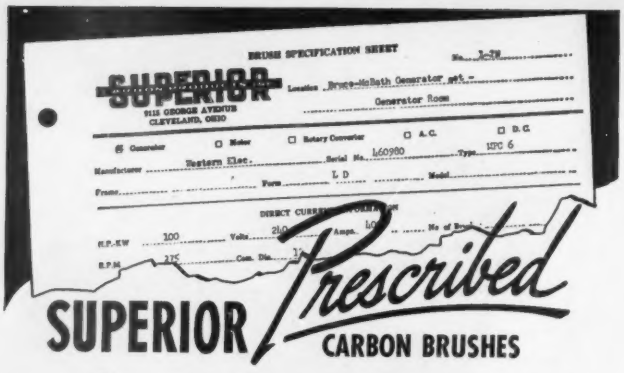

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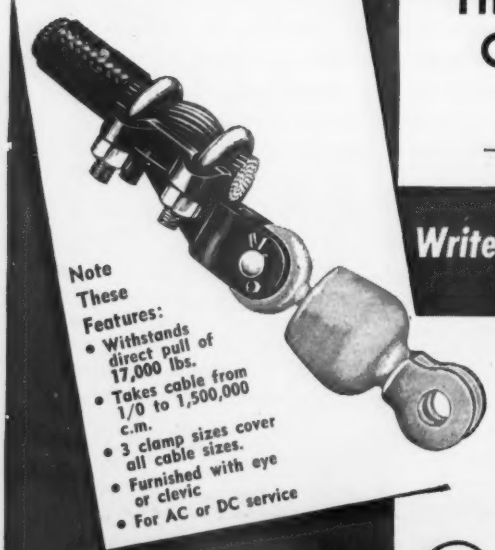

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Traveling Lighting Clinic Announced

The General Electric Company has recently announced a new type of exposition and program called "The G-E Traveling Lighting Clinic". Designed to be transported cross-country by motor van, the first unit of this mobile clinic is scheduled to leave Cleveland in 1950, G. E.'s Nela Park officials stated.

To be sponsored jointly by local electrical utility companies and the General Electric Company, the long-range traveling clinic program is described as being "geared to the current buyers' market", and designed to acquaint specific groups throughout the country with lighting information and equipments best suited to their needs. These traveling clinics "mark the first time an organization has offered the trade a complete "lighting package" which includes the full cooperation and coordination of all branches of the lighting industry", according to E. D. Stryker, manager of utility sales and fixture promotion for G. E. Lamp Department.

Five specific fields of lighting will be covered by the clinics. These are schools, offices, stores, homes and factories. Local community clinic sessions will be participated in by local electrical wholesalers, lighting equipment manufacturers, electrical contractors and others, under the guidance of the local utility company.

A typical lighting clinic performance will consist of a series of presentations, spread over three days, with each session designed to show the exact lighting needs of the five fields of lighting to be covered. It will literally transport the newest lighting techniques and demonstration facilities of the G. E. Lighting Institute at Nela Park to the nation during the next year or two.

Frequently, G. E. officials pointed out, the traveling clinics will be five-day projects, requiring one full day for setting up the show, three days for conducting the clinic, and a fifth day for packing up for travel to the next city. In other cases, they stated, the clinic will remain in a given city for an extended stay, giving a series of presentations until all persons interested have had an opportunity to attend a session on any of the five lighting subjects to be covered.

According to Willard C. Brown, manager of General Electric Lamp Department's engineering division, each of the traveling clinics will have its complete demonstration equipment as well as suitable arrangements for showing the large number of fixtures involved in portraying the proper equipments for the various lighting appli-

cations. A lighting engineer and his assistant will accompany each clinic. They will be joined in the various territories by the local G. E. Lamp Department lighting engineer. Some of the talks and discussions will be presented by them; other presentations will be made also by the lighting staff of the electric utility company sponsoring the clinic.

"It is expected that the instructive nature of the various talks, combined with the demonstrations and discussions covering the lighting equipments especially applicable to the places under consideration, will prove to be a powerful attraction", Brown stated.

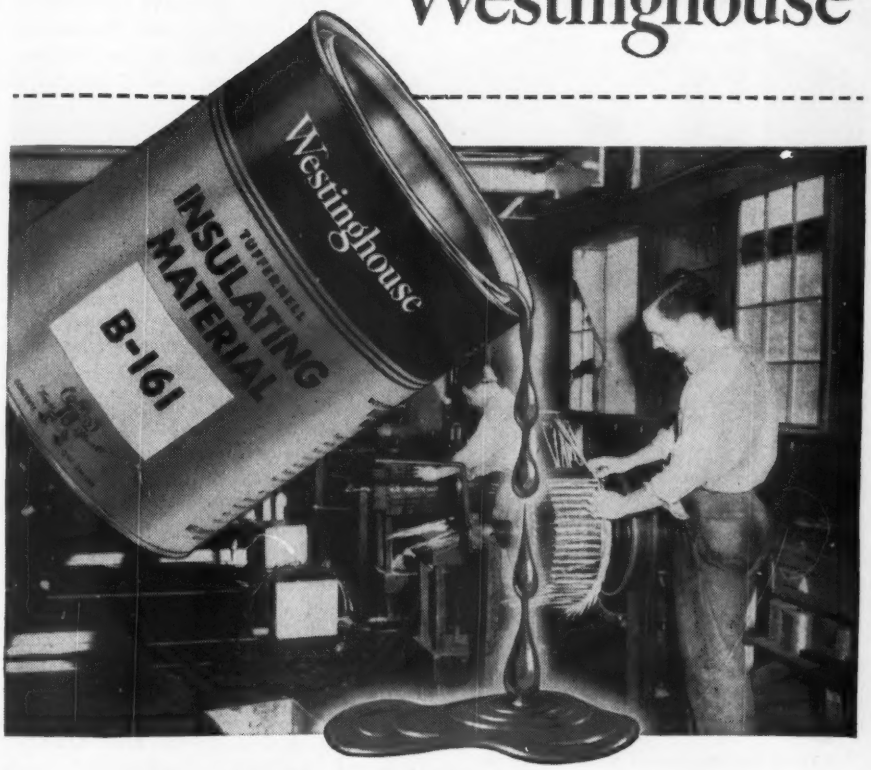
For school board officials or parent-teacher representatives, as an example, there will be complete demonstrations showing the good and the bad features of schoolroom lighting, of decorations and furnishings. A lecture-discussion will reveal what is needed in the way of lighting and surroundings and how these may be achieved. Next, the audience will be invited to inspect the many booths equipped with virtually all types of lighting fixtures most suitable to specific school areas. Ample time will be set aside for examination and discussion of these lighting equipments. Whenever possible, complete information will be made available on how the lighting equipments can be obtained locally.

Equally complete will be the demonstrations, displays, and discussions concerning store, office, factory and home lighting. Thus, entirely unlike the conventional exposition, which sometimes confuses the visitor with its hodge-podge of displays, the traveling lighting clinic will handpick its exhibits to suit the individual needs of separate audiences. The exhibits will be changed between the various clinic sessions.

RESPONSIBLE FOR ***electrical safety in St. Louis County, Missouri are: (L to R) electrical inspectors F. G. Rohn, Neil W. Butteiger and Walter A. Mason, Sr., all of Clayton, Missouri.***

YOU CAN BE SURE.. IF IT'S

Westinghouse



4-WAY PROTECTION

FOR LONG ELECTRICAL LIFE

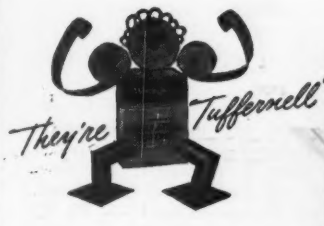
Give electrical apparatus the benefit of Tuffernell 4-Way Protection:

1. High dielectric strength
2. Long life at Class B operating temperatures
3. Excellent resistance to moisture, oil, acids and alkali
4. High bonding strength

These qualities are characteristic of the new Tuffernell Thermo-setting Varnishes. For example, Tuffernell B-161 is already a favorite with many users. It provides the *extra* protection needed for dependable operation under conditions where ordinary varnishes break down.

A good illustration is the growing use of Tuffernell for mine electrical equipment. Below ground, and above, the service is unusually severe. Many progressive mine operators now use Tuffernell exclusively when rebuilding apparatus.

Such proof of performance is assurance of dependability for your equipment, too. For data on the complete Tuffernell line, call your nearby Westinghouse office. Ask for Bulletins 65-120 and 65-130. Or write Westinghouse Electric Corporation, Dept. 112, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-06453



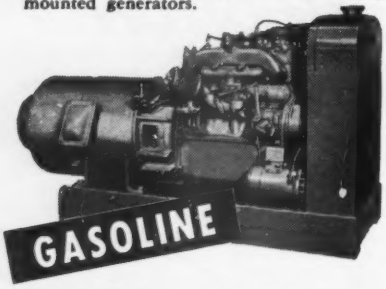
Westinghouse

TUFFERNELL INSULATING VARNISHES

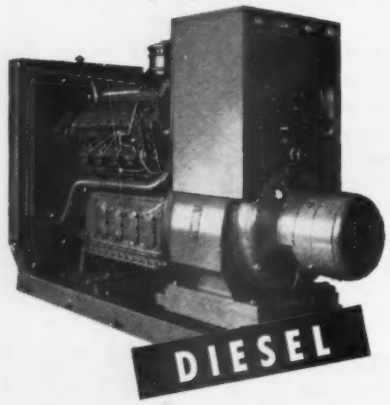
—for every electrical need

For Built-in Dependability

You'll find the correct on-the-job power plant for your needs in the *complete* "U. S." line: from small units easily carried by one man, up to large trailer mounted generators.



From ½ kw up — A.C. and D.C. You can recommend these units with complete confidence. Their "built-in" dependability is the result of over 40 years manufacturing experience.



2½ to 140 kw, A.C. and D.C. All are full diesel, compression ignition, solid injection type. Write for information Please state type and capacity in which you are interested.

UNITED STATES MOTORS CORP.
580 Nebraska St. Oshkosh, Wis.
Foreign Division: 212 E. Washington Ave., Madison 3, Wisconsin, U.S.A.

Kessler Elected President of IAEL

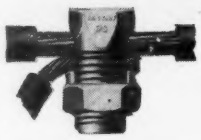
A. H. Kessler, executive secretary of North Central Electrical Industries, was elected president of the International Association of Electrical Leagues at the 14th annual conference of the group in Cleveland, October 11-15.

The meeting program ranged from economic outlook to league management discussion. Speakers from all branches of the electrical industry reviewed current trends and forecast market opportunities. Among the roster of guests who addressed the league managers were Donald S. Thompson, vice president, Federal Reserve Bank of Cleveland; R. L. White, president, Landers, Frary & Clark; Elmer L. Lindseth, president, Cleveland Electric Illuminating Co.; Miss Karen Fladoes, Nash-Kelvinator Corp.; S. B. Williams, Sylvania Electric Products, Inc., reporting for the Industrial and Commercial Lighting Equipment Section of NEMA; J. R. Cobb, Frigidaire; Dan Halpin, R.C.A.; W. T. Stuart, editor, *Electrical Construction and Maintenance;* T. O. McQuiston, Edison Electric Institute; Howell G. Evans, vice president, Hamilton Manufacturing Co.; H. H. Brenan, Pennsylvania Power & Light Co.; P. D. Briggs, Ilg Electric Ventilating Co.; and W. H. Robinson, Lamp Department, General Electric Co.

The International Association of Electrical Leagues consists of 51 groups located in the major marketing centers of the United States and Canada engaged in developing and implementing local business building programs for all branches of the industry.

WESTERN SECTION I.A.E.I. officers elected at recent convention in St. Louis are: (L to R) president —W. J. Alcock, Chicago; 1st vice-president—O. E. Radtke, Cleveland, Ohio; 2nd vice-president — H. L. Parks, Charleston, W. Va.; secretary-treasurer—F. H. Moore, Indianapolis, Ind. (not present).

DOSSERT CONNECTORS



DOSSON
Service Connectors
For quick efficient connections of solid and stranded conductors in sizes No. 14 to 1000 MCM.

Bolt Type Service Connectors

DOSULON—for conductor sizes from 2/0 to 1000 MCM. Rugged, high strength, compact, facilitates neat taping.

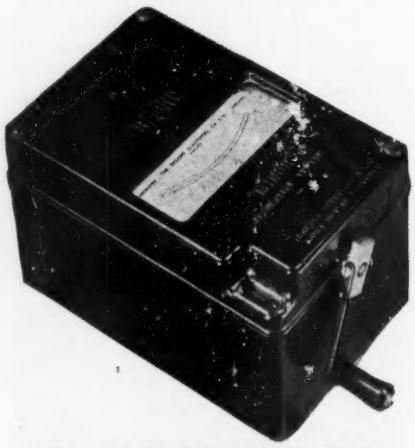
DOS-LUG
Solderless Terminal Lugs

A compact, inexpensive, all-purpose lug for high performance.

"Insist on a Genuine DOSSERT"
Write for Bulletin T49-2

DOSSERT MFG. CORP.
249-255 HURON STREET, BROOKLYN 22, N. Y.
SINCE 1904

Meet the New
"MINOR" MEGOHMER
PINT SIZE INSULATION TESTER



500 VOLTS DC GENERATOR

Range 0-50 megohms. Weight 3 lbs. True Ohmmeter, independent of generator speed. Furnished with genuine leather carrying case, 6' test leads, 50 megographs.

Write for New Bulletin No. 450

HERMAN H. STICHT CO., INC.
27 PARK PLACE NEW YORK 7, N. Y.

Nebraska-Iowa Council Meets in Omaha

New officers elected to the Nebraska-Iowa Electrical Council, Inc., at the annual meeting, November 3-4, were: Clarence Helgesen, president, Sidles Company, Omaha; Harry M. Binder, 1st vice-president, Evans Electric Construction, Omaha; W. H. Sinke, 2nd vice-president, Consumers Pub. Power, Columbus; R. C. Hagen, secretary, General Electric Company, Omaha; Paul Constant, treasurer, Schmoller & Mueller, Omaha.

The meeting brought together over 300 electrical contractors, dealers, wholesalers and utility representatives for a two-day conference and trade show. Frank Watts, of *Farm Journal*, opened the program in a discussion of the relation of electricity to the farmers' problems. Hammond U. Mann of H. U. Mann Company of Chicago urged more stable sales and merchandising techniques in the sale of electrical appliances.

A. H. Kessler, executive secretary of North Central Electrical Industries, Minneapolis, reviewed the opportunities open to the electrical industry in the coming year. Dean Ashley, credit manager of J. L. Brandies and Sons, Omaha, outlined the problems of credit in these changing times.

Ralph W. Carney, vice president in charge of marketing of the Coleman Company, Wichita, urged better training and more executive attention to the "weakest link" in modern sales, the retail sales-person.

A session devoted to Adequate Wiring heard W. T. Stuart, editor, *Electrical Construction and Maintenance*, point up the contractor's stake, and Norman Wick, field representative, National Adequate Wiring Bureau, present the industry case for Adequate Wiring.

Lighting occupied a major portion of the program in a symposium on "Planned Lighting". Speakers included Dorothy Blade, home lighting specialist, Omaha Public Power District; Carl F. Jensen, district engineer, Westinghouse Lamp Division, Chicago; H. R. Weibel, district engineer, General Electric Lamp Department, Kansas City; and C. R. Tracy, commercial manager, Sioux City Gas & Electric Company.

Survey Reveals High Cost of Glare

Manufacturers in widely varying fields are becoming increasingly conscious of discomfort, loss of efficiency,

There's Plus Profit in

Sangamo Interval Timers

Make extra profit by selling a Sangamo Type T or TJ Timer with every fan or window type air conditioning unit your customers buy . . . They provide selective, convenient control by automatically switching off the unit after it has been turned on at any pre-selected period from 15 minutes to 12 hours.

Sangamo Timers are exceptionally attractive in appearance—their small size and ivory color blend well with any installation—and they are unusually dependable, fully guaranteed, and priced right!

Sangamo Timers are available in two types: Type T for wired-in construction and Type TJ for portable convenience.

Full information is given in Catalog 1010A. Write for your copy today.

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

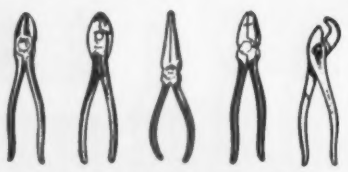
WHEN YOU USE PLIERS... *You need* CHANNELLOCK

Easy to remember... CHANNELLOCK

No matter what your work . . . plumbing, electrical, automotive, aviation, battery or ignition—there is a Channellock plier designed specifically for your job. If you use pliers . . . you need Channellock.

CHANNELLOCK

The exclusive tongue and groove joint gives you these "plus" features: Greater Strength, Longer Wearing, Self-Cleaning, Closely Spaced Adjustments, Visible Adjustments, No Wear on Joint Bolt.



Send for Catalog C-6 today

CHAMPION DEARMENT TOOL CO
MEADVILLE • PA.

Only Champion DeArment makes

CHANNELLOCK

CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK • CHANNELLOCK

and in general the high cost of glare. Also, surfaces which absorb light and do not reflect to the owner all the light he pays for are poor investments.

These conclusions have been reached by T. D. Wakefield, vice president of F. W. Wakefield Brass Co., Vermilion, Ohio, manufacturers of lighting equipment, after a study of business and trade paper advertising for six months in mid-1949. In this study, the advertising of manufacturers not connected with lighting was scanned, and limited to those who feature no-glare surfaces to reduce eye strain when using their product, or reflectant non-glaring surfaces which do not unduly absorb light.

During the investigation 51 advertisements cropped up which were definitely based upon absence of glare or good reflectance without glare. Sixteen were in the field of paint and cement; 5 in the field of business machines; 7—furniture (office or comparable); 6—glass block or tile; 3—tools; 3—chalk boards for schools; 4—partitions; 3—paper where glare is probably most apparent; 2—automotive; and 2—miscellaneous.

Of these, 25 were in terms of glare reduction, 17 featured proper reflectivity of light from the surface, and 7 were in general terms of better seeing because of the surfaces on the products advertised.

Wakefield points to the results as indicative of a knowledge about principles of lighting and seeing that is spreading beyond the manufacturers of lighting equipment.

"We have long recognized," he says, "that mere quantity of light is not enough for good seeing. If quantity alone were the answer it would be easy to hang up enough bare light bulbs or fluorescent tubes to give the amount of light desired. Yet the result would be painful in direct glare from the lights and because of equally destructive glare reflected from white glossy paper, shiny desk tops, or bright machine surfaces".

He says that in the ideal seeing environment no one is conscious of the light source. This condition is attained by proper shielding of lighting equipment and by elimination of the glare spots which result from working surfaces that are too shiny.

Wakefield believes that seeing conditions indoors will improve much more rapidly in the next generation than they have in all preceding periods.

Dates Ahead

Essex Electrical League — Christmas luncheon, Essex House, Newark, N. J., December 8.

Electrical & Gas Association of N. Y., Inc. —Christmas luncheon, Hotel Astor, New York City, December 21.

1 MAN CAN DO THE WORK OF A CREW...

with an

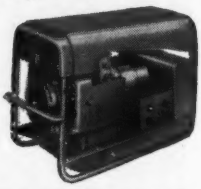
ONAN *Portable* ELECTRIC PLANT

Use Electric Tools on Every Job!

Speed the work, cut costs on installation and maintenance jobs. Lightweight Onan air-cooled electric plants supply electric power anywhere for lights, drills, saws, hammers, spades and other motor-driven tools. Equipped with carrying handles or dolly-mounted. Take 'em anywhere and plug in for all the power you need.

SHIPPED COMPLETE READY TO RUN

Gasoline powered models—
A. C.: 350 to 35,000 watts.
D. C.: 750 to 15,000 watts.
Diesel plants: 2,500 to 55,000 watts.



Write for Folder

Model 5CK, 5,000 watts D. C. Weighs only 315 lbs.

Onan PRODUCTS

D. W. ONAN & SONS INC.
3172 Royalston Avenue
Minneapolis 5, Minnesota.

CONNECTORS ACCESSORIES

SOLDER LUGS
SERVICE CONNECTORS
FUSE CLIPS
TERMINALS
SHADING COILS ETC.

NEW 80-page catalog now ready showing over 2,000 Ilsco items in color.

WRITE FOR CATALOG TODAY

ILSCO COPPER TUBE & PRODUCTS, INC. CINCINNATI 27, O.

Plant Maintenance Show and Conference—Auditorium, Cleveland, Ohio, January 16-19.

American Society of Heating and Ventilating Engineers—Dallas, Texas, January 23-27.

Southwest Air Conditioning Exposition—Dallas, Texas, January 23-27.

American Institute of Electrical Engineers—Winter general meeting, New York, N. Y., January 30-February 3.

National Electrical Manufacturers Association—Edgewater Beach Hotel, Chicago, Ill., March 13-16.

American Society of Tool Engineers—Industrial exposition, Convention Hall and Commercial Museum, Philadelphia, Pa., April 10-14.

Chamber of Commerce—38th Annual meeting, Washington, D. C., May 1-4.

National Fire Protection Association—54th Annual Meeting, Haddon Hall, Atlantic City, N. J., May 15-18.

National Industrial Service Assn.—Annual meeting, Boston, Mass., June 5-7.

National Association Electrical Distributors—Annual convention, Atlantic City, N. J., June 12-16.

Manufacturers News

GENERAL ELECTRIC APPOINTMENTS

New appointments in the recently consolidated wiring device and accessory equipment division of General Electric's Construction Materials Department have been announced. G. E. Wickman, manager of the department, has appointed George S. Alcorn as his staff assistant. At the same time, T. D. Foster, manager of sales for the division, has named F. C. Dazley as sales manager, wiring device sales, and H. A. Rawson as sales manager, for accessory equipment sales.

Charles E. Mindnich has been appointed a wire and cable specialist for G. E.'s Construction Materials Department. He will make his headquarters in Philadelphia where he will serve the Construction Materials Atlantic District.

C. W. Bryant, assistant production manager in G.E.'s apparatus department, has been appointed purchasing agent of the ferrous products division. He will succeed Arelin L. Wagoner, who will continue work of an advisory and consulting capacity in the division.

K. N. Bush of Lynn, Mass., assistant to the production manager of the Apparatus Department's Aircraft Gas Turbine Divisions at the Lynn River Works, will succeed Bryant.

Richard Cutts Jr. has been named manager of sales for the central station divisions. His headquarters will be in Schenectady. Mr. Cutts was formerly assistant manager of sales for the G.E. meter and instrument divisions at Lynn, Mass. He will be succeeded in Lynn by Donald E. Craig, who has been manager of sales for the unit substation section of the central station divisions.

The appointment of G. K. Iwashita as manager of product planning of G.E.'s Air Conditioning Department, Bloomfield, N. J., has been announced. Prior to his appointment, Mr. Iwashita was manager of product research of the Seeger Sunbeam Corp., Evansville, Ind.

FULLMAN Latrobe PRODUCTS

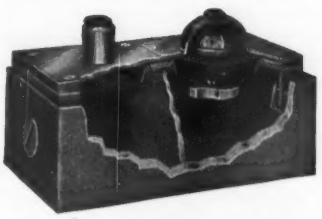
FLOOR BOXES — WIRING SPECIALTIES

FULLMAN MANUFACTURING CO. QUALITY AT LATROBE SUPREMACY LATROBE, PA.

Tops in Design, Quality and Performance — "Latrobe"

"Latrobe" Floor Boxes and Wiring Specialties are designed to do their job easily and surely with no excess parts. This same compactness of design makes for fast, easy installations.

"Latrobe" Floor Boxes are popular everywhere because, being made well, they serve well.



No. 252-R "Latrobe" Two Gang Box

This adjustable Two Gang Floor Box has No. 208 Receptacle in one section. It is efficient and economical. One Cover Plate has ½" Flush Brass Plug; the other, 2" Flush Brass Plug.

No. 284 Nozzle with No. 200 Cover Plate

This Duplex Receptacle Nozzle is one of the many well designed Nozzles for use with "Latrobe" Watertight Floor Outlets. The No. 284 is furnished with ½" or ¾" Brass Pipe Extension.

No. 110 "Latrobe" Watertight Box

A sturdy, non-adjustable Floor Box that is a dependable performer. Can be speedily installed and is watertight. Has 208 Receptacle. Cover Plate 3½" diam.

No. 150 Box—No. 207 Nozzle

A compactly built box for installation in concrete or wood finished concrete floors. Adjustable and watertight. 4½" Cover Plate No. 242 and large Adjusting Ring No. 215.

No. 330 Tom Thumb Utility Outlet

Perfect for use in wood floors, mantels, baseboards and other installations free from moisture or mechanical injury. Installed easily without maring finish.

Sold Only Through Wholesalers

No. 1050 Cable Staple for ROMEX and Non-Metallic Covered Cable

Here is a brand new cable staple designed especially for use with Romex and all non-metallic covered cable. 1⅛" long by 9/16" wide.

FULLMAN MANUFACTURING CO.
LATROBE . . . PENNSYLVANIA

THREADING PIPE IS NOW THE EASIEST JOB WE DO!

NO. 422 POWER VISE STAND

A portable power drive for hand pipe tools

"Why—oh why—does ANYONE waste time and energy threading, cutting-off and reaming pipe by hand?"

That's a common question asked by users of the Oster POWER VISE STAND.

This low cost machine takes over ALL the hard work...*does it up to 5 times FASTER, too!* Your hand die-stocks, cutters and reamers are instantly converted to POWER tools when you own the Oster Power Vise Stand. *It's the lightest weight, lowest cost, most convenient motor driven portable pipe machine you can buy!*

Standard range is ⅛" to 2" pipe. Connected to a special, universal drive shaft, the machine has ample power to drive geared, receding die-stocks and cutters up to 8" capacity. Illustrated catalog FREE on request.

MAIL THIS

THE OSTER MANUFACTURING CO.
2081 EAST 61st STREET
CLEVELAND 3, OHIO, U. S. A.

O.K. Oster! I want your No. 422 catalog as soon as possible.

NAME_____

COMPANY_____

ADDRESS_____

FIBERGLAS NAMES NEW BRANCH MANAGERS

Appointment of new branch managers to head the Fiberglas sales offices in New York, Chicago and Detroit has been announced by Owens-Corning Fiberglas Corporation.

Named branch manager in New York was Harold D. Bates, formerly general merchandising manager of Philip Carey Mfg. Co., Cincinnati. Russell R. Galloway was appointed manager of the Chicago branch office. He was formerly president of Smith Asbestos Company, Milington, N. J. John J. Hartnett was named manager of the Detroit branch office. Mr. Hartnett was formerly general sales manager of the Certain-teed Products Corp.

LIGHTOLIER APPOINTMENTS

Edward H. R. Blitzer has been named assistant to the president and Meyer Loebelson has been appointed general sales and advertising manager of Lightolier, Inc.

Edward Blitzer, formerly sales manager of the organization, has been connected with Lightolier since 1938. During the war he served as a lieutenant commander in the Navy.

E. H. R. BLITZER

MEYER LOEBELSON

The appointment of Mr. Loebelson places the coordination of sales and promotional programs under a single office. Mr. Loebelson has been with Lightolier since 1921 and advertising manager since 1945.

What Makes a Mailing Click?

Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd Street, New York, 18, N. Y.

ADVERTISEMENT

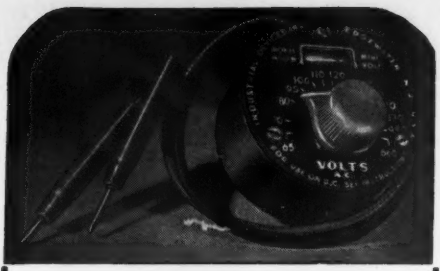
EASIER GOING...

...With Buying Information

In his business, Mr. William J. Rudolph, owner of Rudolph Electric Company, Chelsea, Mass. needs up-to-date product information, for himself and his customers, on a wide variety of electrical equipment and supplies.

He finds the going easier because McGRAW-HILL'S PRE-FILED ELECTRICAL CATALOGS supplies just the data needed in easy-to-get-at form. In a recent note, Mr. Rudolph said *"This Catalog is very helpful to buyer and seller."*

If PRE-FILED ELECTRICAL CATALOGS is not available for buying reference at your plant, write to McGRAW-HILL CATALOG SERVICE, 330 West 42nd Street, New York 18, N. Y. There is no charge to qualified users.



MINI-VOLT

Instantly read voltages right off dial. 65 to 660 v. AC. Also DC. Virtually burnout-proof Lamp guaranteed for 25,000 hours' operation. Plastic case. 12" flexible test leads. *And only $2.75 list!*

- **Not only distinguishes between 110, 220 etc. volts, but measures line voltage close enough to show up 2 volt drop between meter and load terminals on 110 v. line.**
- **No electrical worker need now be without definite knowledge of whether faulty operation of motors, or other electrical equipment, etc. is due to improper terminal voltage.**
- **Checks for blown fuses, accidental grounds, circuit continuity. Useful for electrical trouble-shooting in general.**
- **Not subject to error of "False Indication" common to neon test lamps.**

It's a "must". Saves time, money, life and limb! Order from supplier, or from

INDUSTRIAL DEVICES, INC., EDGEWATER 9, N.J.

UNEQUALLED

. . . FOR MOISTURE-PROOF SPLICES

. . . users who KNOW buy only the BEST

Ask for them by name . . .

OKONITE and MANSON tapes

HOLOPHANE ELECTS VICE PRESIDENT

The Board of Directors of Holophane Company, New York, recently elected Henry L. Logan to the newly created post of vice president in charge of research. Mr. Logan was previously

H. L. LOGAN

manager of the department of applied research.

In his new position he will be expected to put more emphasis on careful research in improving the products, application techniques and marketing practices of the company with the object of creating the greatest possible benefit to the ultimate user.

ROBBINS & MYERS AND HUNTER FAN UNITE

The affiliation of two of the oldest fan manufacturers, Robbins & Myers, Inc., Springfield, Ohio, and Hunter Fan & Ventilating Company, Inc., Memphis, Tenn., has been announced by A. W. McGregor, president of Robbins & Myers. Both companies will continue to operate as separate organizations and no change of policy is contemplated for either company.

Robert H. Peoples will retire as president of Hunter Fan to serve on the Board of Directors of the Springfield firm.

WESTINGHOUSE CHANGES

Harry J. Deines of New York, an advertising executive with nearly 20 years of experience in the electrical manufacturing field, has been named manager of advertising and sales promotion for the Westinghouse Electric Corp., Pittsburgh, Pa.

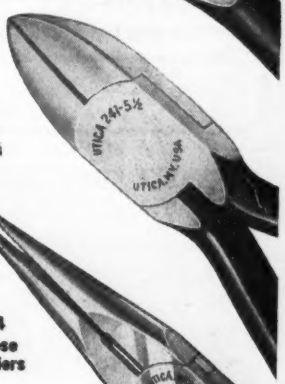
Marvin W. Smith, president of the Baldwin Locomotive Works has been elected a director of the Westinghouse Electric Corp.

The appointment of J. L. Cross as manager of power transformer sales for the Westinghouse Transformer Di-

There's a **UTICA TOOL** *for every electrical job!*

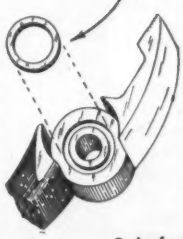
You'll find standard lineman's and electrician's pliers for every specialized job in the *complete* Utica Tools line . . . field-tested and proven to meet every demand for quality and hard use.

TOOL NO. 259-P
New England Head Lineman's Side-Cutting Pliers
6", 7", 8"



TOOL NO. 241
Electrician's Diagonal Pliers
5", 5½", 6"

TOOL NO. 254
Long Chain Nose Side-Cutting Pliers
6½"



UTICA "LUBRING" PLIERS

The porous iron ring in the joint is impregnated with oil and keeps the rubbing surface of the joint lubricated for life!

Order from Your Wholesaler

U-TI-CA

Utica Tools

FOR MORE TOOL MILEAGE

UTICA DROP FORGE and TOOL CORP.
UTICA 4, NEW YORK

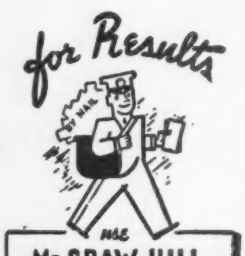
COMPLETE STOCKS **WESTINGHOUSE! WAGNER! DELCO!**

Electric Motor Parts

Send for Your Catalog On Your Letterhead Today to . . .

The HARRY ALTER Co.

1728 S. Michigan Ave. Chicago, Ill. — 134 La Fayette St. New York, N.Y.



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330 West 42nd Street New York, 18, New York

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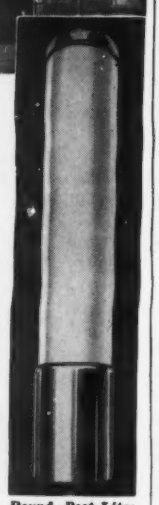
The big development in outside business lighting is to the "new method of lighting" made possible by Post-Lites, the new all-weather fluorescents. These dramatic, stream-lined lights radiate light in all directions. They completely dominate any surroundings. Visible a mile away. Attract business like nothing else can. One installation sells others. This is your big opportunity!

Post-Lites are well engineered by a 38 year old company. Good in zero weather. Wide variety of types install on posts, walls, corners. Mail coupon for Catalog. See your wholesaler.



Round Post-Lites straddle pipe posts. Half-round Post-Lites mount on walls. Also other models

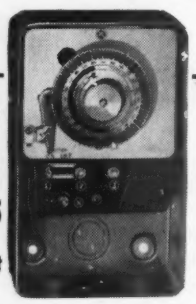
W. H. LONG CO., 108-114 W. Illinois St., Chicago 10.

Please mail Catalog.

Name .....

Address .....

LOOK!



Paragon
MODEL 301
TIME SWITCHES
Only $11.50 List
and with
LOWEST NET PRICES TO CONTRACTORS

Paragon top quality, straight "ON and OFF" Time Switches are accurate and dependable for controlling stokers, burners, valves, motors and other equipment where two or four operations per day are required. Industrial type, self-starting motor, 115 volt, 60-cycle, 30 Amp., 3000 Watt capacity. Shock-proof terminal back. SPST and DPST; (230V, or 24V, at slightly higher cost).

SEE YOUR JOBBER OR WRITE FOR CATALOGS

Paragon ELECTRIC COMPANY
1614 12th STREET • TWO RIVERS, WISCONSIN
AMERICA'S FOREMOST EXCLUSIVE MANUFACTURER OF TIME CONTROL SWITCHES FOR ALL USES

vision at Sharon, Pa., has been announced. Mr. Cross succeeds C. H. Bartlett who has recently been made sales manager for the entire transformer division.

Thomas A. Daly has been appointed engineering manager in charge of all Naval Ordnance Work of Westinghouse at Sharon, Pa.

Charles F. Wagner has recently been appointed consulting engineer for the Westinghouse central station and power fields.

Announcement has been made of the appointment of J. T. Mathews as manager of the foreign engineering department. He succeeds E. P. Schroeder, who retired after 26 years of service with the company.

Dr. Charles M. Slack has been named technical director of Westinghouse's atomic power division. In his new position he will have staff responsibility for the general direction and coordination of all research and engineering work of the division.

•

Enameled Metals Company has announced the appointment of Allied Industries, Los Angeles, Calif. as sales representatives for Southern California, Arizona and Southern Nevada.

•

S. J. Woodworth has been appointed sales manager of the Wright Hoist Division of **American Chain & Cable Company, Inc., Bridgeport,** Conn. He succeeds A. R. Haskins, who has resigned from the company to establish a business in Milwaukee, Wis.

•

Elliott Company, Jeanette, Pa. has acquired the business and assets of **Crocker-Wheeler Electric Manufacturing Company** and will operate as a division of Elliott Company.

•

Buffalo Pumps, Inc., Buffalo, N. Y., has announced the election of Henry D. Wilson and Bruce W. Ellis to the board of directors.

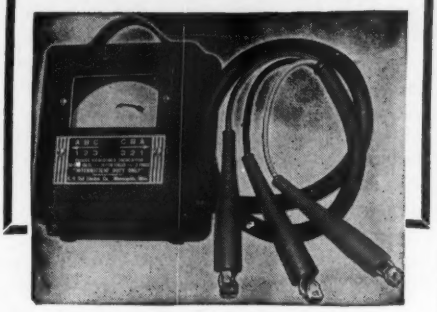
•

L. S. Brach Manufacturing Corporation of Newark, N. J. has named Joseph F. Bozzelli, assistant sales manager.

•

The Porter-Cable Machine Company, Syracuse, New York, manufacturers of Speedmatic and Guild portable electric tools, purchased the manufacturing rights and facilities of the Sterling Electric Tool Products Company, Chicago, Ill., for the production of the

Quick POSITIVE PHASE ROTATION READINGS



WITH THE NEW

SELCO INDICATOR

50 to 600 volts; 25 to 400 cycles; 2, 3 or 6 phase

AVOID COSTLY MISTAKES. Get accurate readings quick.

IDEAL FOR UTILITIES, contractors, industrial plants, electrical equipment manufacturers, maintenance men, etc.

INDICATES IMMEDIATELY phase sequence by numerical, alphabetical, color coding, and CW-CCW methods.

SELF CONTAINED and light weight. Portable. Weighs less than 3½ lbs.

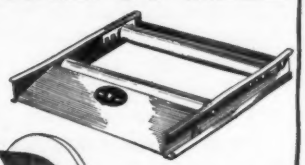
Write for FREE Folder No. 728 today.

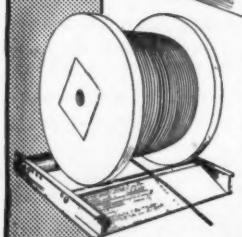
H. H. SELL ELECTRIC CO.
3240-C Dakota Ave., Minneapolis 16, Minn.

Time to Discard
OLD-FASHIONED WAYS

Jacks . . props . . shores . . horses . . why fool with these obsolete methods of handling reels? DO IT THE MODERN, EFFICIENT WAY! Reel or unreel wire, cable, rope with

ROLL-A-REEL





Simple, strong, easily handled stand for your reels to save time and labor. Adjustable slots for variety of reel sizes.

Style A: 2,000 lbs. cap. 37.50
Style B: 4,000 lbs. cap. 75.00
f.o.b. Cincinnati

WRITE FOR DETAILS TODAY

ROLL-A-REEL
327 WEST FOURTH STREET
CINCINNATI 2, OHIO

Sterling portable electric and pneumatic sanders, DeAlton J. Ridings, president of the Porter-Cable Company announced recently. The inventory tools and production facilities will be moved to Syracuse.

•

Independent Pneumatic Tool Company, of Aurora, Illinois, has announced the appointment of new managers at its sales and service branches in Denver and San Francisco. Eugene C. O'Connell, formerly service engineer in the Los Angeles branch, is the new manager at San Francisco. Clarence H. Gabriel, formerly service engineer in the Salt Lake Branch, is the new manager at Denver.

•

Ralph Brengle, general sales manager of **Potter & Brumfield,** has moved his office to Princeton, Indiana, and will hereafter conduct sales from the manufacturing plant there. Since 1945, Mr. Brengle has been located at 549 West Washington Blvd., Chicago. The Chicago office will continue at the same address under John Newman for regional sales.

•

Cannon Electric Development Company, Los Angeles, Calif., has appointed the manufacturers' representative firm of O. F. Masin, 17 East 42nd Street, to represent the company's multi-contract connector lines in the New York area, replacing Lewis & Sachs Company.

•

Harold D. Gobble, formerly manager of the oil field division of **Fairbanks, Morse & Co.,** has been appointed manager of the Dallas, Texas, branch house. He succeeds Harry J. Renken who has been transferred to the company's headquarters in Chicago to become oil field division manager.

•

The F. W. Wakefield Brass Company of Vermilion, Ohio, has announced the appointment of William A. Heth as sales representative for the eastern half of Wisconsin. Mr. Heth's headquarters will be in Milwaukee.

•

Soldering Specialties, Summit, N. J., has announced the appointment of four regional representatives. Gerber Sales Co., Boston, Mass., will cover the New England area; Harry C. Stockfleth, Chatham, N. J., the New York Metropolitan area; Harold F. Anderson, Detroit, Mich., the Michigan area; and Arthur J. Ellis Co., Chicago, Ill., will cover Illinois, Indiana, Wisconsin and Iowa.

EASIER! FASTER!

Drilling Cutting Chipping in Concrete and Masonry with

SYNTRON

DEPENDABLE

ELECTRIC HAMMERS

3600 powerful blows per minute from one working part — the "PISTON".

Speed up work—eliminate slow, laborious hand hammer and drill.

Four models available—all for operation from your 110 volt A.C. light source.

Write for illustrated Literature

SYNTRON CO.
690 Lexington Ave. Homer City, Pa.

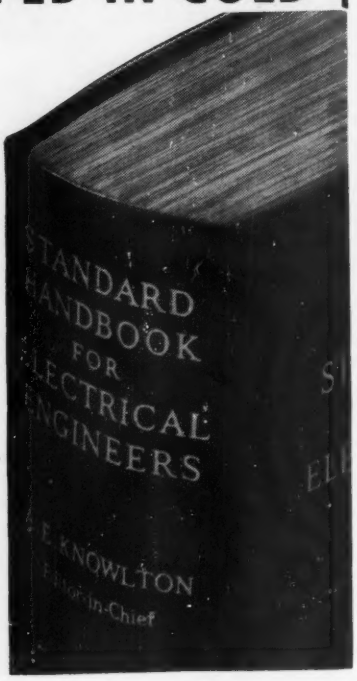
Special pre-Christmas offer

YOUR NAME STAMPED IN GOLD

ON THE COVER OF THIS BOOK

ABSOLUTELY FREE

Without cost to you, we will stamp your name, or whatever name you designate, on the front cover of any copy of the Standard Handbook for Electrical Engineers ordered from this advertisement. This is a special pre-Christmas offer, limited to acceptance before December 24, 1949. So don't delay. Use the convenient coupon below.



Enlarged Eighth Edition

STANDARD HANDBOOK for ELECTRICAL ENGINEERS

Archer E. Knowlton
Editor-in-Chief
Senior Associate Editor, Electrical World
and R. M. SHOOP,
Assistant Editor
Assistant Editor, Electrical World

Prepared by a staff of 101 experts

2311 pages, 6x9 1961 Illus., over 600 Tables, $12.00

HERE'S an encyclopedia of facts and figures, definitions, conversion factors, physical and mathematical principles, accepted formulas and experimental data. This reliable handbook offers the electrical engineering information you want in a compact, easy-to-use form that ensures quick, fingertip reference on any problem you meet.

An indispensable guide for 41 years

Close to 100,000 men in the electrical engineering field are guided by this Standard Handbook. Its 2311 power-packed pages give you the combined experience and knowledge of leading experts in the field. The most frequently required fundamental theories are given the same thorough coverage as the wealth of completely new information on methods and materials packed into this big volume.

Includes important new developments in the field

Recent years have brought more startling developments in the electrical engineering field than almost any other era . . . here are those discoveries completely explained for you and added to this treasure chest of engineering information:

—the chemical elements uncovered by atomic energy
—new insulations like rubber, other elastomers and plastics
—the complexities and potentialities of nuclear energy
—new equipment like the servomechanisms and rotating regulators
—radar and associated microwave techniques
—the entire new field of airplane power distribution
—induction and dielectric heating
—complete revamping of the much-consulted subject matter on conductors
—recasting of the sections on generators and transformers, affording a practical approach to "loading by temperature"

These 26 sections help solve your problems:

1. Units and Conversion Factors
2. Electric Magnetic Circuits
3. Measurements
4. Properties of Materials
5. Circuit Elements
6. Transformers, Regulators, and Reactors
7. Alternating-current Generators and Motors
8. Direct-current Generators and Motors
9. Rectifiers and Converters
10. Prime Movers
11. Power-plant Economics
12. Power System Electrical Equipment
14. Power Distribution
13. Power Transmission
15. Wiring Design—Commercial and Industrial Buildings
16. Illumination
17. Industrial and Commercial Power
18. Electric Heating and Welding
19. Electricity in Transportation
20. Electrochemistry and Electrometallurgy
21. Batteries
22. Wire Telephony and Telegraphy
23. Electronics and Electron Tubes
24. Radio, Radar, and Carrier Communication
25. Codes and Standard Practices
26. Electrophysics

ACT NOW! THIS SPECIAL PRE-CHRISTMAS OFFER EXPIRES DECEMBER 24, 1949

JUST CLIP AND MAIL COUPON

McGRAW-HILL BOOK CO., INC., 330 W. 42nd St., NYC 18, N. Y.
Send me Knowlton's STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS, Eighth Edition, according to terms checked below:

☐ With name stamped in gold. I enclose $12.00 and understand books are not returnable. (Offer expires December 24, 1949).

☐ For 10 days' examination without gold stamping. In 10 days I will return book or remit $3.00, plus a few pennies postage, and $3.00 monthly until the total price of $12.00 has been paid. (We pay for delivery if you send first payment with this coupon.)

Name .....
Address .....
City .....Zone.....State.....
Company .....
Position .....EC 12-49

Print name to be stamped, here. This offer applies to U. S. only.

Logan Engineering Company has announced completion of details involved in merging the Dor-O-Matic Company into the Logan organization. The manufacture of the Dor-O-Matic Door Control has been transferred from the Dor-O-Matic factory at 818 S. Kolmar Avenue, Chicago, to the recently enlarged Logan plant at 4901 West Lawrence Ave., Chicago. A Dor-O-Matic division has been set up within the Logan Organization to handle production and distribution of the line of door checks on a nationwide basis.

•

J. A. Tills has joined **Leader Electric Co.**, Chicago. He formerly was manager of lighting sales for Hyland Electrical Supply Co. and prior to that district lighting supervisor for Westinghouse Electrical Supply Co.

•

John A. Roebling's Sons Company, Roebling, N. J., has announced the appointment of J. F. Berger as manager of sales for industrial wire products and Samuel K. Hornor, manager of sales for hardware products.

•

Spencer R. Griffiths has been appointed assistant sales manager of **Unistrut Products Company,** Chicago, Ill. He was formerly associated with Joseph T. Ryerson & Son Incorporated, in charge of stainless steel sales in the midwest district.

•

Curtis Lighting, Inc., Chicago, has announced the appointment of Fred A. Stewart as Philadelphia area representative.

•

At a recent meeting of the Board of Directors of **Sperti Faraday, Inc.,** Adrian, Mich. William H. Albers of Cincinnati was elected president, John T. Swanwick, Adrian, vice president and Fred B. Fischer, Adrian, general sales manager.

•

I-T-E Circuit Breaker Company, Philadelphia, has announced the appointments of Harry K. Wilcox, Jr., to the position of assistant sales manager, and Nye S. Spencer as manager, equipment sales.

•

Delta-Star Electric Co., Chicago, has recently appointed A. J. Elggren & Sons Co., Salt Lake City, Utah, as district representative for the states of Idaho and Utah.

•

Eutectic Welding Alloys Corporation recently opened a new plant in Flushing, N. Y.

SEARCHLIGHT SECTION

(Classified Advertising)

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UNDISPLAYED —RATES— DISPLAYED

90 cents per line, minimum 4 lines. To figure advance payment count 5 average words as a line. **INDIVIDUAL EMPLOYMENT WANTED** undisplayed advertising rate is one-half of above rate, payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as one additional line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $9.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An Advertising Inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

E.C.M.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION WANTED

ELECTRICAL DRAFTSMAN — Designer, B.S. E.E., age 29, 3 yrs. power, 3 yrs. electronics. Desires work in N. Y. City area with electrical contractor or consulting engineer. Prefer smaller firms where I can do more responsible work. Want to gain experience in all-around contracting. PW-1492, Electrical Construction & Maint.

WANTED

ANYTHING within reason that is wanted in the field served by Electrical Construction & Maintenance can be quickly located through bringing it to the attention of thousands of men whose interest is assured because this is the business paper they read.

ELECTRICAL CABLE

- for every industrial and power application.
- Special constructions. Odd lengths.
- Large stocks on hand of high voltage, lead covered cables not ordinarily stocked by your regular suppliers.
- Cut to length. Reasonably priced.

UNIVERSAL Wire and Cable Co.
2664 N. Clybourn Ave. Chicago 14, Ill.

WATTHOUR METERS

Large Stock - Reconditioned - Guaranteed Single-Phase, Polyphase and DC —Write for Bulletin.

MASPENOCK ELECTRIC LIGHT CO.
44 Starr Lane Jamaica Plain, Mass.

EXPLOSION PROOF MOTOR STARTERS

General Electric CR-7006B1B
Class 1 Group D, Size 1 440 Volt
3 Phase 60 Cycle Cat 4389098G104
Reset Button in Cover, Magnetic

Price $25.00 Ea. F.O.B. East St. Louis, Ill.
Guaranteed
LOWRY ELECTRIC CO
416-22 E. Broadway East St. Louis, Illinois

FOR PROMPT ANSWERS

to your business problems

use

The SEARCHLIGHT SECTIONS

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Aviation Week
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Bus Transportation
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Coal Age
Construction Methods
Electrical Construction and Maintenance
Electrical Merchandising
Electrical World
Electronics
Engineering and Mining Journal
Engineering News-Record
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Factory Management and Maintenance
Food Industries
Nucleonics
Operating Engineer Power
Product Engineering
Textile World
Welding Engineer

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Classified Advertising Division

McGRAW-HILL PUBLISHING CO., INC.
New York 18, N. Y.

FOR SALE

2—100 KW 250 volt DC Generators. Steam driven by Ball Engines—140# pressure.
1—200 KW 250 volt DC Generator. Steam driven by Ball Engine—140# pressure. Units complete with DC switchboard and two balancer sets.
1—20 ton York Vertical Ammonia Compressor. Steam driven by Corliss Engine —140# pressure.
1—15 ton York Vertical Ammonia Compressor. V belt drive. 33 H.P.—DC motor. Complete with condenser, receiver, valves, gauges, etc.
150—DC motors—various sizes.

PURITY BAKERIES
97 E. 12th St. St. Paul 1, Minn.

MOTORS, GENERATORS, TRANSFORMERS

1 — 1500 H.P.
Bought and Sold
New and Rebuilt

ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

FLUORESCENT FIXTURES

Large quantity Surplus NEW Fluorescent Lighting Fixtures priced below wholesale for quick disposal, in original cartons. Sylvania 4' Industrial type, each complete with 2—40 watt tubes, baked enamel finish. Cat. No. HF-100.

STEPHEN A. DOUGLASS CO.
630 Fort Washington Ave., New York 33, N. Y.

WANTED

BUYERS OF SURPLUS COPPER INSULATED WIRES AND CABLES

No lengths too long or too short
Telephone: Eastgate 7-4778
PIERCE CABLE CO.
2664 Clybourn Ave., Chicago 14, Illinois

BOOKS

ELECTRICAL CONTRACTORS ESTIMATING HANDBOOK

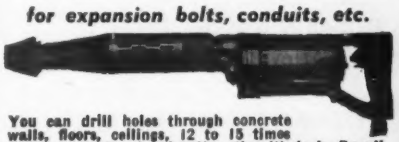
"A Unique Tool of the Trade"
WRITE FOR DESCRIPTIVE FOLIO TO
THE ESTIMATOR PUBLISHING CO.
1805-B 60th St. Kenosha, Wis.

WHERE TO BUY

Equipment, Materials, Supplies and Services for Electrical Construction — Maintenance — Repairs

How to drill Concrete

for expansion bolts, conduits, etc.



You can drill holes through concrete walls, floors, ceilings, 12 to 15 times faster than by hand. Use the Wodack Do-all Electric Hammer. Typical example: drills a ⅝" hole 1" deep through average concrete in less than 15 seconds! Saves time and money. You also use Wodack Do-all for chipping concrete, drilling wood, metal, etc. Investigate.

WRITE TODAY FOR BULLETIN 471-EC

Wodack Electric Tool Corporation
4627 W. Huron St. Chicago 44, Ill.

A. C. ANYWHERE

with Katolight Plants. Dealers who use these portable Plants for electric drilling, testing wiring circuits, etc., will find easy sales to other tradesmen such as carpenters, wool blowers, plumbers, etc.
Mfgrs. of A.C. Generators up to 375 KVA, Rotary Converters, Motor Generator Sets, A.C. and D.C. Motors.

Write for pamphlet

KATO ENGINEERING COMPANY
1442 First Avenue
Mankato, Minnesota

MATERIALS-METHODS

Materials & Methods engineers in America's leading manufacturing plants use Topflight's Printed Cellophane, Self - Adhesive Tapes to meet A-N specs. - assembly line - follow through - instruction labels. Easy to Apply.

TOPFLIGHT TAPE CO. - YORK PA.

A GOOD Habit

The Where-to-Buy Section of Electrical Construction and Maintenance supplements other advertising in this issue with these additional announcements of products and materials of special interest and application in the field of electrical construction, maintenance and repair work. Make a habit of checking this page each issue—a *good* habit!

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The Labor Union Monopoly Bites *ALL* Workers

What kind of government is it which:

. . . Prosecutes the Great Atlantic & Pacific Tea Company which it asserts handles about 6½% of the retail food distributing business as an illegal monopoly in restraint of trade, and

. . . Seeks to break up four big meat packing companies and make them into 14 companies, charging the four with being a monopoly in restraint of trade, but

. . . Makes no move whatsoever to apply the federal anti-trust laws to the exercise of virtually 100 percent monopoly control of labor in the coal industry, and the only slightly less complete monopoly control of labor in the steel industry?

The answer to that question is simple. It is class government of the most flagrant type, a government by which special privileges are dispensed without justice and to the great injury of all workers. It is the kind of government which will lead to the early sacking of the American enterprise system and the personal freedoms of workers.

In legal terms the explanation of this flagrant affront to good government is also simple. In 1932 labor union activities were given virtually complete exemption from the application of the federal anti-trust laws by passage of the Norris-LaGuardia Act.

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When the Norris-LaGuardia Act was passed labor unions were relatively weak. Only about 16% of the nation's industrial workers were organized, only about 12% of the steel workers. About two-thirds of the coal miners were union members, but only half that number were paying dues. The country was in the depth of its worst depression. The unemployment of about one-fourth of the labor force made monopoly control by labor seem so remote as to be almost fanciful.

But after only seventeen years devoted to the promotion of labor union organization by the federal government, we have labor monopoly with us. In its power and scope it makes the alleged business monopolies being prosecuted under the federal anti-trust laws seem positively piddling. In its manners it makes the old-time business monopolists look like Lord Fauntleroys.

What is lacking, grievously lacking, is action by Congress; action to shape our federal anti-trust laws to take account of the labor monopoly that has become the dominant national force in our country today—a force that is leading to the loss of freedom of all workers.

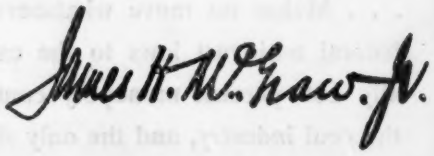
Before labor monopoly is broken up, as it must be broken up if our economy is not to be permanently wrecked, other steps will no doubt be required. But one test more than any other will be the touchstone of the nation's determination to keep its economic and personal freedom. It is what it does to see that labor monopoly receives the same treatment under the federal anti-trust laws as any other kind of economic monopoly.

The purpose of the federal anti-trust laws is to break up monopoly and preserve fair competition in the United States. It is a fine purpose. The wisdom and fairness of its application in particular cases is often open to challenge. But in spite of bad administration every farsighted business man I know is a staunch defender of our national anti-trust policy.

At present, in the exemption of labor monopoly, we have a breach in that policy which, if not closed, will soon become fatal both to the policy and the enterprise system it is designed to foster and protect.

The main thing wrong today with Great Britain and indeed all Europe is that no effective anti-trust laws are in existence to protect the public from business and labor monopolies, to guarantee personal freedoms. No free economy in Europe or America can prosper as long as protected monopolies remain and flourish.

While your representatives in Congress are home with you talk to them about the special privileges now granted to labor union monopoly. You would serve your country well by finding out what they intend to do about it before it is too late.



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